Trans-Lake Washington Project
Washington State Department of Transportation
Sound Transit

FINAL DRAFT TECHNICAL MEMORANDUM

PRICING AND MANAGED LANES
Trans-Lake Washington Corridors

INTRODUCTION

The purpose of this memorandum is to provide technical information on the performance and evaluation of the transportation pricing and managed lane alternatives analyses for the Trans-Lake corridors. Much of this memorandum focuses on the three build alternatives currently being evaluated by the Trans-Lake Washington project, and how they interact with the I-90 corridor.

- Safety and Preservation Alternative (4 Lane Alternative)
- Added HOV Lane Alternative (6 Lane Alternative)
- Added HOV and GP Lanes Alternative (8 Lane Alternative)

Each of these alternatives were evaluated at a corridor level, under the assumption that the potential for a regional system of managed lanes and/or transportation pricing program may become part of a long-range plan for the Central Puget Sound Region. This is consistent with the Puget Sound Regional Council (PSRC) policy framework outlined in the "Destination 2030" regional plan.

This memorandum is organized into four sections. The first section of this memorandum presents a general description of the transportation pricing and managed lane alternatives that were modeled for the Trans-Lake corridor. The second section describes the modeling methodologies that were used in modeling the transportation pricing and managed lane alternatives, and includes the estimation of toll rates and revenue estimates for the Trans-Lake corridor. The third section describes and presents the performance of the transportation pricing and managed lanes alternatives. The fourth and final section provides conclusions from the analysis, and provides recommendations for the next steps to define a pricing and/or managed lane option for the SR 520 corridor.

TRANS-LAKE MANAGED LANE AND TRANSPORTATION PRICING ALTERNATIVES

A total of seven alternatives were modeled using PSRC's suite of travel demand models. Six of these were transportation pricing alternatives, while the seventh was a managed lane alternative.

Transportation Pricing Alternatives

The concept of Value Pricing, also known as peak period pricing has been used in this study. It entails tolls or user fees that vary with the level of congestion on a facility. The more congested a facility is, the higher is the toll or user fee to use that facility. The more expensive the toll, the lower will be the number of users willing to pay the toll, thereby managing congestion on the facility.

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Road user fees or tolls that vary with the level of congestion provide incentives to shift some trips to less congested routes (local arterials), or alternative modes (carpooling and transit), or trip chaining (combining trips), or eliminate the trip, or shift the trip to off-peak period times. Since, off-peak period is also tolled in our study, this shift would not occur in our analysis.

Value pricing can be implemented only with Electronic Toll Collection (ETC) technology. The user fees or tolls can change every five minutes, with enough lead time such that a traveler knows exactly how much will be charged upon entry to a facility. This option has become technically viable within the last few years, as applications in California (SR 91 and I-15) have successfully demonstrated.

The following provides a description of the six transportation pricing alternatives that were modeled using the toll estimation methodology described in the following section of this memorandum.

Safety and Preservation Alternative - 4 Lanes

1. **4 Lane Value Pricing Concept – Toll on SR 520:** AM, PM and Off Peak period value pricing on SR 520 from SR 202 to I-5. All users (SOV and HOV 3+) with the exception of transit will be subject to tolls. Since SOV and HOV users share the same lanes and are not physically separated, the value pricing modeling methodology used to estimate toll rates cannot differentiate between SOV and HOV users, hence, all users are tolled. However, this would not be the case in the real world, because Electronic Toll Collection (ETC) technologies that are currently available are capable of differentiating between SOV and HOV users, and thus can toll SOV only.

2. **4 Lane Value Pricing Concept – Toll on SR 520 and I-90:** AM, PM and Off Peak period value pricing on SR 520 from SR 202 to I-5 and I-90 from SR 900 (Issaquah) to I-5. All users (SOV and HOV 3+) on SR 520 will be tolled. Only SOV and HOV 2 will be tolled on I-90, while HOV 3+ will not be subject to toll. Transit will not be tolled on both SR 520 and I-90.

Added HOV Lane Alternative - 6 Lanes

3. **6-Lane Value Pricing Concept – Toll on SR 520**: AM, PM and Off Peak period value pricing on SR 520 from SR 202 to I-5. All SOV and HOV 2 users will be tolled, while HOV 3+ and transit users will not be tolled.

4. **6-Lane Value Pricing Concept – Toll on SR 520 and I-90:** AM, PM and Off Peak period value pricing on SR 520 from SR 202 to I-5 and I-90 from SR 900 (Issaquah) to I-5. All SOV and HOV 2 users will be tolled, while HOV 3+ and transit users will not be tolled.

Added HOV and GP Lanes Alternative - 8 Lanes

5. **8-Lane Value Pricing Concept – Toll on SR 520**: AM, PM and Off Peak period value pricing on SR 520 from SR 202 to I-5. All SOV and HOV 2 users will be tolled, while HOV 3+ and transit users will not be tolled.

6. **8-Lane Value Pricing Concept – Toll on SR 520 and I-90:** AM, PM and Off Peak period value pricing on SR 520 from SR 202 to I-5 and I-90 from SR 900 (Issaquah) to I-5. All SOV and HOV 2 users will be tolled, while HOV 3+ and transit users will not be tolled.

Managed Lane Alternative

The following provides a description of the managed lane alternative that was modeled using PSRC's suite of travel demand models:

Added HOV and GP Lanes Alternative – 8 Lanes

7. **8-Lane Managed Lanes Concept – 4 General Purpose (GP) Lanes + 4 Managed Lanes:** No pricing on the 4 GP lanes for SOV and HOV 2 users. HOV 3+ and transit users will not be tolled on the 4 managed lanes. HOV 2 users can "buy in" by paying a toll to use the HOV managed lanes. HOV 2 access to the HOV managed lanes will only be allowed at the following locations:

    - Montlake Blvd.
    - Bellevue Way/104th Avenue NE
    - I-405 (via HOV direct access ramps)
    - Vicinity of NE 32nd Street (direct HOV access ramps near Overlake)
    - SR 202 (East Terminus)

    The decision for providing limited access points for HOV 2 to "buy into" the corridor was dictated by the primary objective of maintaining uncongested travel conditions on the managed lanes, where transit speeds and reliability would not be compromised. Depending on the performance of the limited access points, and the amount of un-used capacity on the managed lanes, additional access points could then be identified along the corridor for HOV 2. If the managed lanes had un-used capacity still available, then SOV trips would be allowed to "buy into" the corridor. In such a case, the tolls for SOV to "buy into" the corridor would be set much higher than that for HOV 2 users.

METHODOLOGIES FOR MODELING TRANS-LAKE ALTERNATIVES

Travel Forecasting Analysis

The Puget Sound Regional Council (PSRC) four-county travel demand forecasting model was applied to forecast general traffic, carpool, and transit demand for transportation alternatives studied in the Trans-Lake corridor. The PSRC model is multimodal and captures both regional and corridor-level trip making. The current version of the PSRC model was updated/refined for use on the Trans-Lake Washington Study and Alaskan Way Viaduct (AWV) Project. The aim of the additional validation analysis to the current PSRC model was to achieve an acceptable level of accuracy at key screenline locations critical to the Trans-Lake and AWV projects. The objective of this effort was not to replace or supersede the already validated PSRC model, but to enhance its capabilities to produce more accurate forecasts in the areas under study. It is expected that the methodological components of this model (e.g., trip distribution, mode choice, and time-of-day analysis) will be replaced once the ongoing PSRC model improvement program is successfully completed. The additional PSRC model validation analysis performed by Parsons Brinckerhoff, Inc. for the Trans-Lake and AWV Projects has been documented in the *Travel Forecasting Model Validation Report for Base Year (1998), issued in February 2002.*

Once additional validation analysis was completed for the year 1998, the model was applied to produce future year 2030 baseline travel forecasts as well as forecasts for 6-Lane and 8-Lane Alternatives reflecting additional capacity on SR 520. The baseline forecast is referred to as the "No Action" Alternative and all other Alternatives are compared against it. The "No Action" Alternative includes only those transportation improvements that have committed funding. The main differences among the Alternatives were captured by changes in the highway and transit networks. The future highway and

transit networks, representing each of the Alternatives, were developed using the same coding conventions as used in the 1998 network. Year 2030 travel forecasts were prepared using forecasted population and employment, parking costs, and other data from the PSRC, consistent with the 2030 Metropolitan Transportation Plan adopted in May 2001.

Travel Forecasting Analysis Managed Lanes Alternative

The updated PSRC model was used to produce travel forecasts for a managed lanes alternative on SR 520. The concept modeled included two managed lanes in addition to two lanes for general-purpose traffic in each direction. Access to the managed lanes was restricted to 2+HOVs during both peak and off-peak periods and at the planned direct access locations.

Value Pricing Sensitivity Analysis

As stated previously, the Puget Sound Regional Council's regional travel demand model and forecasting procedures were adapted for analyzing value pricing within the context of tolling limited access facilities. While these tools represent the best methods available for feasibility purposes, this work is at the edge of their intended application, and moreover, the timing is such that this work does not benefit from work-in-progress improvements to the regional model.

The value pricing methodology, developed for PSRC as part of the overall congestion pricing analysis performed during the 2030 MTP development process,[1] was used to perform the pricing sensitivity test for the Trans-Lake Alternatives. In theory, the mechanism by which tolls are simulated within the regional model is relatively simple. On an un-priced roadway, users consider only their own travel time costs, and not the delay costs their vehicle imposes on other users. This behavior tends to result in roadway over-consumption and congestion, especially during peak demand times. Optimal travel behavior – that which theoretically minimizes overall network travel time – could be induced by applying tolls that are equivalent to the incremental delay imposed on others, with the revenues used to make cost-beneficial transportation investments. This is referred to as the "economically efficient" toll.

The modeling approach employed seeks to internalize the external time cost or incremental delay that an additional vehicle imposes on all other vehicles in the traffic stream. When users are compelled to consider this additional cost, some users alter their travel behavior, resulting in lower highway volumes, and higher resulting speeds. As roadway demand increases, the economically efficient or optimal toll also rises at an increasing rate to maintain reasonable speed and flow conditions, by inducing a sufficient number of would-be road users to seek alternative routes, modes, or times to travel.

Model results from this methodology provided an estimate of potential traffic diversion and mode choice effects of pricing on SR 520 and/or I-90 under each Trans-Lake Alternative. This procedure also provides an estimate of pricing time costs that can be used to calculate an average toll rate for each time period on each Trans-Lake facility based on assuming a pertinent value for "willingness-to-pay" or travel time.

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[1] Detailed descriptions are presented in the "Puget Sound Regional Council Transportation Pricing Alternatives Study – Technical Memorandum 3: Simulating Congestion Pricing in EMME/2," prepared by R. Pozdena, EcoNorthwest, February 19, 2000.

Estimation of Toll Rates

Estimated optimal toll rates are available from an analysis of value pricing on a system of limited access facilities in King County and southern Snohomish County undertaken for WSDOT Urban Corridor Office. The analysis, which was done in parallel with the evaluation of pricing and managed lanes for the Trans-Lake Washington Project, is described in *Regional Toll Revenue Feasibility Study, Draft Report*, July 2002. The regional modeling assumed the 6-lane alternative for SR 520, no improvements to I-90, and tolls applied to both facilities, as well as other major urban highways including I-5, I-405, SR 167, SR 509 and SR 99.

Optimal toll rates, expressed in time costs as minutes per mile, are derived from the model results – based upon the volumes and volume-to-capacity ratios for each roadway link in the model. Toll rates are aggregated to analysis segments and calculated by time period (AM peak, PM peak, and midday/evening off-peak) and direction of travel over a 15 hour portion of the day. The resulting toll time costs are then converted to monetary units by applying the average willingness to pay for delay reduction, expressed in dollars per hour. Research has shown that this value of time is approximately one-half of the average wage rate. For purposes of these analyses, the value of time was varied between one-third and one-half of the average wage rate for King County to create a range of monetary toll rates. The toll rates are expressed in inflated dollars escalated to the year of collection, and apply to single and two occupant vehicles. Three-plus occupant vehicles and transit vehicles are assumed to use HOV lanes at no charge or would otherwise be exempted from tolls. Trucks are tolled at a multiplier of the auto toll rates.

Tolls are assumed to be collected electronically throughout the regional toll network. The AM and PM peak periods would vary in timing and duration by facility and location, but in no cases are they less than three hours. Peak toll rates would vary noticeably by facility conditions, levels of congestion, and location to remain at their optimal levels. With reduced facility demand, the off-peak toll rates are generally lower. Off-peak tolls would apply to a midday window of time on weekdays, weekday evenings from 7 – 9 PM, and weekends from 6 AM – 9 PM. The network was assumed to be toll-free every day from 9 PM – 6 AM, both to give users an un-priced choice of travel, and also because, in most cases, traffic volumes are not high enough to generate optimal toll rates much above zero.

Application of the toll modeling methodology within the PSRC regional model results in modified traffic forecasts of vehicular travel within the general purpose lanes, and allows for the calculation of the optimal toll rates per mile by time period and analysis segment. Transit vehicles and 3+ HOVs using the toll-free HOV lanes are excluded from these traffic forecasts.

Results for value pricing these facilities individually would likely vary, but the differences may be small in the case of the cross-Lake Washington facilities. The toll modeling reported in this report resulted in volumes and congestion levels for a priced 6-lane Trans-Lake alternative (together with pricing on I-90) similar to those projected for the SR-520 and I-90 components in the *Regional Toll Revenue Feasibility Study*'s toll network modeling effort. This is primarily due to the fact that cross-Lake Washington travel is a somewhat captured market with few other reasonable alternatives.

Table 1 presents the 2014 and 2030 range of optimal toll rates per mile by time period and facility for a base value of time equal to one-half the average wage rate for King County, while Table 1a presents a range of optimal toll rates per mile for a low value of time equal to one-third the average wage rate for King County. Year 2014 is assumed as the year of project completion, and 2030 as the planning horizon year. The toll rates are expressed in year 2000 dollars and apply to single and two occupant vehicles. Transit and three-plus occupant vehicles are assumed to use toll-free HOV lanes, when available. Trucks are tolled at a multiplier of the auto toll rates.

Table 1: Weekday Toll Rate Estimates / Base Value of Time Equals 1/2 Wage Rate

Model Estimated Toll Rates (Year 2000 $) – 2014

Toll Facility	Toll Distance	PM Peak Period — $ / mi			AM Peak Period — $ / mi		
		Minimum	Maximum	Average	Minimum	Maximum	Average
I-90	13.3	$0.03	$0.19	$0.09	$0.03	$0.13	$0.06
SR 520	12.8	$0.04	$0.31	$0.14	$0.03	$0.21	$0.09

Note: All amounts are in year 2000 dollars and are based on a value of time of $11.83 / hour
SR 520 tolled sections include the entire facility
I-90 tolled sections extend from I-5 to SR 900 in Issaquah
Off peak toll rates range from 3¢ to 5¢ per mile

Model Estimated Toll Rates (Year 2000 $) – 2030

Toll Facility	Toll Distance	PM Peak Period — $ / mi			AM Peak Period — $ / mi		
		Minimum	Maximum	Average	Minimum	Maximum	Average
I-90	13.3	$0.03	$0.22	$0.13	$0.03	$0.13	$0.07
SR 520	12.8	$0.06	$0.40	$0.19	$0.03	$0.21	$0.11

Note: All amounts are in year 2000 dollars and are based on a value of time of $11.83 / hour
SR 520 tolled sections include the entire facility
I-90 tolled sections extend from I-5 to SR 900 in Issaquah
Off peak toll rates range from 3¢ to 7¢ per mile

Table 1a: Weekday Toll Rate Estimates / Low Value of Time Equals 1/3 Wage Rate

Model Estimated Toll Rates (Year 2000 $) – 2014

Toll Facility	Toll Distance	PM Peak Period — $ / mi			AM Peak Period — $ / mi		
		Minimum	Maximum	Average	Minimum	Maximum	Average
I-90	13.3	$0.02	$0.12	$0.06	$0.02	$0.09	$0.04
SR 520	12.8	$0.03	$0.20	$0.09	$0.02	$0.14	$0.06

Note: All amounts are in year 2000 dollars and are based on a value of time of $7.89 / hour
SR 520 tolled sections include the entire facility
I-90 tolled sections extend from I-5 to SR 900 in Issaquah
Off peak toll rates range from 2¢ to 3¢ per mile

Model Estimated Toll Rates (Year 2000 $) – 2030

Toll Facility	Toll Distance	PM Peak Period — $ / mi			AM Peak Period — $ / mi		
		Minimum	Maximum	Average	Minimum	Maximum	Average
I-90	13.3	$0.02	$0.15	$0.09	$0.02	$0.08	$0.05
SR 520	12.8	$0.04	$0.27	$0.12	$0.02	$0.14	$0.07

Note: All amounts are in year 2000 dollars and are based on a value of time of $7.89 / hour
SR 520 tolled sections include the entire facility
I-90 tolled sections extend from I-5 to SR 900 in Issaquah
Off peak toll rates range from 2¢ to 5¢ per mile

The following points should be noted in interpreting these toll rates in the context of the Trans-Lake transportation pricing alternatives analysis.

- If value pricing was implemented only on SR 520, then the travel cost of the I-90 alternative route could look relatively more favorable than if both crossings were value priced. This could lead to more diversion to I-90, and an equilibrium situation that results in lower volumes, and thus, lower V/C ratios and toll rates on SR 520 than shown in Table 1 and 1a.

- Because the toll rates in Table 1 and 1a are from a system-wide analysis of value pricing, in the absence of tolls on the other facilities, diversion from SR 520 and I-90 to drive-around options could be greater, and thus, actual maximum toll rates could be lower than those presented.

- ***Estimate of Average Toll on SR 520 – Base Value of Time Equals One-Half the Wage Rate.*** Assuming a maximum trip length of 12.8 miles on SR 520, the **average** toll for a one-way peak period trip across SR 520 from Redmond (SR 202) to Seattle (I-5) in 2014 (assumed year for implementing tolls) and 2030 is shown in Table 2. Average tolls for a one-way peak period trip from I-405 to I-5 (6.8 miles) is also provided. These values of toll are reported in year 2000 constant dollars.

- ***Estimate of Average Toll on I-90 – Base Value of Time Equals One-Half the Wage Rate.*** Assuming a maximum trip length of 13.3 miles on I-90, the **average** toll for a one-way peak period trip across I-90 from Issaquah (SR 900) to Seattle (I-5) in 2014 and 2030 is also shown in Table 2. Average tolls for a one-way peak period trip from I-405 to I-5 (7.3 miles) is also provided. These values of toll are also reported in year 2000 constant dollars.

Table 2: Average Toll for a One-way Trip (2000 Constant Dollars)
Base Value of Time (Equals 1/2 Wage Rate)

Facility	Trip Length	Average Toll in 2014	Average Toll in 2030
SR 520	12.8 miles (SR 202 to I-5)	$1.15 - $1.80	$1.41 - $2.43
	6.8 miles (I-405 to I-5)	$0.61 - $0.95	$0.75 - $1.30
I-90	13.3 miles (SR 202 to I-5)	$0.80 - $1.20	$0.93 - $1.73
	7.3 miles (I-405 to I-5)	$0.44 - $0.66	$0.51 - $0.95

- ***Estimate of Average Toll on SR 520 – Low Value of Time Equals One-Third the Wage Rate.*** Assuming a maximum trip length of 12.8 miles on SR 520, the **average** toll for a one-way peak period trip across SR 520 from Redmond (SR 202) to Seattle (I-5) in 2014 (assumed year for implementing tolls) and 2030 is shown in Table 2a. Average tolls for a one-way peak period trip from I-405 to I-5 (6.8 miles) is also provided. These values of toll are reported in year 2000 constant dollars.

- ***Estimate of Average Toll on I-90 – Low Value of Time Equals One-Third the Wage Rate.*** Assuming a maximum trip length of 13.3 miles on I-90, the **average** toll for a one-way peak

period trip across I-90 from Issaquah (SR 900) to Seattle (I-5) in 2014 and 2030 is also shown in Table 2a. Average tolls for a one-way peak period trip from I-405 to I-5 (7.3 miles) is also provided. These values of toll are also reported in year 2000 constant dollars.

Table 2a: Average Toll for a One-way Trip (2000 Constant Dollars)
Low Value of Time (Equals 1/3 Wage Rate)

Facility	Trip Length	Average Toll in 2014	Average Toll in 2030
SR 520	12.8 miles (SR 202 to I-5)	$0.77 - $1.15	$0.90 - $1.54
	6.8 miles (I-405 to I-5)	$0.41 - $0.61	$0.48 - $0.82
I-90	13.3 miles (SR 202 to I-5)	$0.53 - $0.80	$0.67 - $1.20
	7.3 miles (I-405 to I-5)	$0.29 - $0.44	$0.37 - $0.66

Estimation of Toll Revenue

Revenue estimates for the tolling of a six-lane SR-520 over its entire 12.8 mile length without tolling I-90 have been developed as part of the Trans-Lake Washington Project and are presented herein. The procedures used for arriving at revenue estimates borrow from the economically efficient toll methods developed and applied in the *Regional Toll Revenue Feasibility Study* and the *Alaskan Way Viaduct Toll Feasibility Study*, but do not fully replicate all of these steps for various reasons.[2] In particular, the existing Trans-Lake toll modeling had not considered the simulation of the proposed highway improvements in the base year of 1999. This set of results would typically be necessary to provide an additional point in time to be compared with the future year in order to interpolate volumes and calculate toll rates revenues, and diversion results for intermediate years. In light of this and other constraints, a streamlined approach was developed that relies on some of the SR-520 toll assumptions and results of the *Regional Toll Revenue Feasibility Study* in order to generate revenue estimates for a stand-alone six-lane SR-520 toll facility.

The economically efficient toll methods essentially derive toll rates that approximate the external costs that an individual roadway user imposes on all other users by choosing to travel at a particular time and location. The toll rates are a function of the volume and capacity conditions that would exist after iteratively applying a modified volume-delay function in the modeling process to account for these external delay costs. The reader is referred to the *Regional Toll Revenue Feasibility Study* for a more detailed explanation of the optimal toll theory and application methods.

The streamlined approach undertaken dictates that toll revenue can only be reasonably estimated for the Trans-Lake alternative that matches the one modeled in the regional tolling study — the six-lane SR-520 configuration. Modeling results for 2030 with and without tolls on SR-520 only were used to estimate

[2] The *Alaskan Way Viaduct Toll Feasibility Study* is dated June 2002 and the *Regional Toll Revenue Feasibility Study (Working Draft)* is dated July 18, 2002. Both were prepared by Parsons Brinckerhoff for the WSDOT Office of Urban Corridors.

gross diversion rates and volume-to-capacity ratios, the latter which serve as inputs to deriving optimal toll rates by time period and direction. Upward adjustments were made to some of the resulting volume-to-capacity ratios for the following reasons. First, the Trans-Lake "without toll" model runs resulted in slightly lower volumes than did the regional toll study "without toll" model runs, particularly during the AM peak period, despite an expectation that they would be about the same. Second, the toll modeling methods used, when applied to a limited one-facility toll network, tend to be more likely to overstate gross diversion in the "with toll" case, and thus, understate revenue, than when tolling is more widespread. Finally, additional model runs to further refine the Trans-Lake toll modeling results to better match the procedures applied in modeling the regional toll network were not possible at this time.

Assumptions regarding the range for the value of time, the time-of-day distribution of traffic, percentage of traffic within the 15-hour toll period, the percentage of trucks by time period, and weekday to weekend factors, among others, were borrowed from the *Regional Toll Revenue Feasibility Study*. Using these assumptions and the calculation tools developed for the regional tolling analysis, a range of revenue was estimated for the stand-alone six-lane SR-520 toll facility.

The range of revenue varies from:

- a "low end" estimate that excludes weekend tolling, uses a relatively low 2x toll multiplier for trucks, and applies a conservative low value of time at one-third the average wage rate;

- to a more likely "high end" value that includes weekends at the off-peak toll rates, a 3x toll multiplier for trucks, and a base value of time at one-half the average wage rate.

This range of revenue was then compared to SR-520's share of 2030 revenue from the regional tolling analysis, and the resulting relationships were used in combination with the 2014 regional tolling revenue estimate for SR-520 to also obtain a 2014 revenue estimate for the stand-alone toll facility.[3]

Findings and results from the revenue analysis of value pricing travel on SR 520 are as follows.

- The 2030 revenue estimate for a stand-alone SR-520 represents 77% of the revenue generated by SR-520 under the regional toll network.

- From a traffic standpoint, the stand-alone toll facility carries 93% of the tolled vehicle miles that are accommodated by SR-520 in the regional toll network (measured over the 15-hour weekday toll period and weekends where applicable).

- Both of these results are expected — in the absence of tolling on I-90 (and I-5/I-405 for that matter), there is more of an incentive for some SR-520 users to divert to I-90 to avoid the toll. Because the optimal toll rate rises exponentially with traffic volumes, 7% lower traffic volumes actually result in 23% lower toll revenues.

- The average toll period gross diversion for SR-520 as a stand-alone toll facility is 23.1%, compared to 18.5% when part of a regional toll network. Gross diversion rates include those travelers who shift modes to transit or HOVs (carpools) and continue to use the facility at the same time.

[3] The base value of time is $11.89 per hour and the low value of time is $7.89 per hour, in 2000 dollars.

Applying the 77% revenue factor to the 2014 regional toll revenue estimates for SR-520 yields an estimated range of toll revenue for SR-520 as a single toll facility. This range approximates the revenue estimates that would likely have resulted with the full application of the toll feasibility methods to a stand-alone six-lane SR-520 toll facility. The revenue range for a stand-alone six-lane SR-520 toll facility is reported in Table 3 for both 2014 and 2030 in inflated, year of collection dollars.

Table 3: Range of Toll Revenue Estimates for a Six-Lane SR-520 Facility

Year	SR-520 Toll Distance (miles)	SR-520 Annual Revenue Range (Inflated Dollars)	
		LOW END: Low Value of Time Weekends Toll-Free 2x Truck Toll Factor	HIGH END: Base Value of Time Weekend Tolling 3x Truck Toll Factor
2014	12.8	$17.7 M	$30.9 M
2030	12.8	$38.4 M	$66.7 M

PERFORMANCE AND EVALUATION OF TRANPORTATION PRICING AND MANAGED LANE CONCEPTS

This section summarizes the transportation performance of the six transportation pricing and one managed lanes concept for the SR 520 corridor. Five mobility criteria were developed for use in the evaluation of these concepts. They are as follows:

- vehicle throughput
- person throughput
- traffic diversion
- volume to capacity (V/C) ratios and speeds
- mode shares

These criteria provide measures of the relative contributions of pricing and managed lanes on the SOV, HOV, and transit trips on the Trans-Lake corridor. It should also be noted that the information presented in this section is an evaluation of the relative performance of the alternatives under each mobility criteria and should not be considered as a representation of the absolute performance of any single pricing alternative.

The Puget Sound Regional Council's travel demand forecasting model was the primary information source for modeling the impacts of pricing and managed lanes on the SR 520 corridor. The PSRC model forecasts daily and peak period travel demand for the corridor in the year 2030. The model forecasts person trips and vehicle trips, and also provides information on travel speeds, volume to capacity ratios,

and mode of travel. The model also provides information on any diversion of traffic caused by the introduction of tolls for crossing Lake Washington. The relative performance of the pricing and managed lanes concepts under each mobility criteria is discussed below.

Evaluation of Value Pricing Concepts

The evaluation of the transportation pricing alternatives focuses on 2030 travel conditions under two sets of pricing assumptions:

1. Peak period tolls on SR 520 Only – for the full length of the corridor (see Table 2 and Table 2a for average toll rates)

2. Peak period tolls on SR 520 and I-90 – for the full length of the corridor (see Table 2 and Table 2a for average toll rates)

The extent of the analysis is limited to an evaluation of cross-Lake Washington traffic patterns across a screenline that represents the following three facilities:

- SR 520 (Lake Washington Bridge)
- I-90 (West Bridge)
- SR 522 (West of 61st Avenue NE)

Presented below is a detailed evaluation of cross-Lake Washington traffic patterns for the 4, 6, and 8 Lane alternatives under the two pricing concepts. This includes an analysis of person throughput, vehicle throughput, traffic diversion, V/C ratios and speeds, and mode shares for each of the Trans-Lake alternatives.

Person Throughput

The total travel demand of daily person trips on the three facilities for the two pricing concepts is illustrated in Figures 1, 2, and 3. These figures summarize the total daily person trip activity and compares daily travel demand on SR 520, I-90, and SR 522 across the three different alternatives (4 Lane, 6 Lane and 8 Lane) under the "No Toll" and Toll scenarios. The Appendix to this report provides detailed forecasts of person trips by mode of travel for the different alternatives under the "No Toll" and Toll scenarios.

Observations – Toll on SR 520 Only

Irrespective of the number of lanes on SR 520, the application of toll on SR 520 results in a general reduction of 10% to 15% of the daily person trips using SR 520. On the other hand, both I-90 and SR 522 show increases in daily person trip activity. I-90 increases are between 5% to 9%, while SR 522 show increases of 3% to 5%.

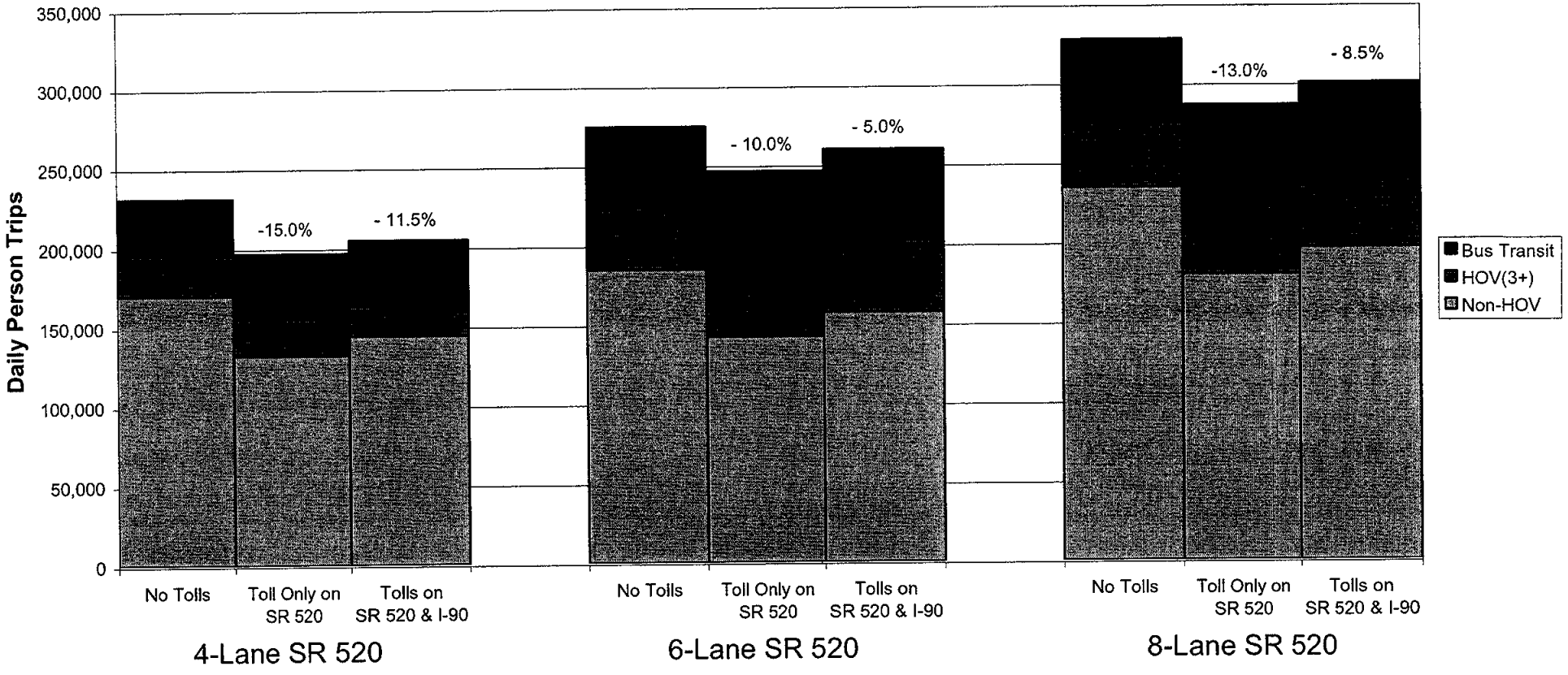
Observations – Toll on SR 520 and I-90

The application of value pricing on both SR 520 and I-90 shows reductions in daily person trip activity across both SR 520 and I-90, while SR 522 shows increases. Both SR 520 and I-90 show decreases of 6% to 12%, while SR 522 shows corresponding increases of 5% to 15% in daily person trip activity.

Summary

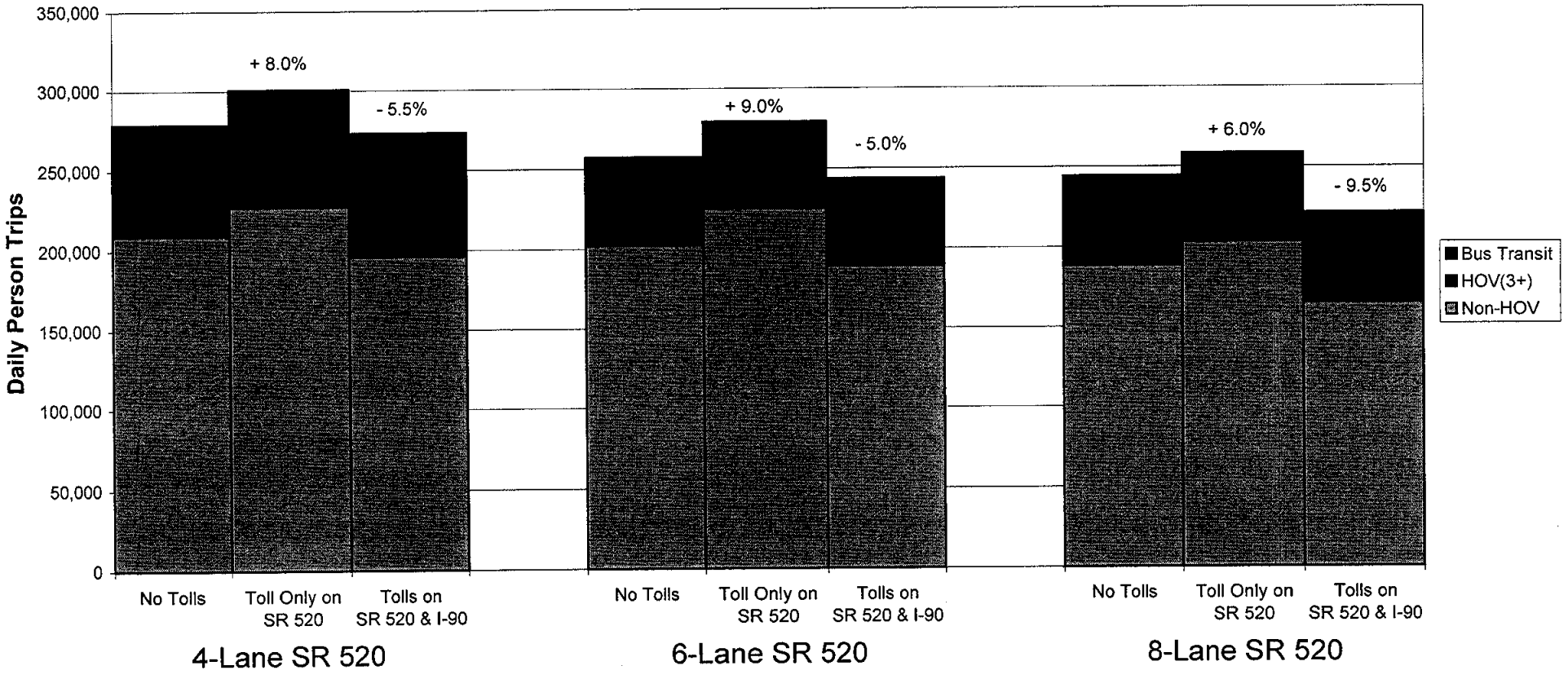
The introduction of value pricing on Lake Washington crossings leads to an overall 6% - 15% reduction in daily person trips crossing Lake Washington. On the other hand, SR 522 shows increases in daily person trip activity ranging between 5% and 15%. To conclude, the introduction of tolls to SR 520 and/or I-90 results in a reduction of total person throughput across Lake Washington.

Figure 1
Daily Person Trip Comparison on SR-520



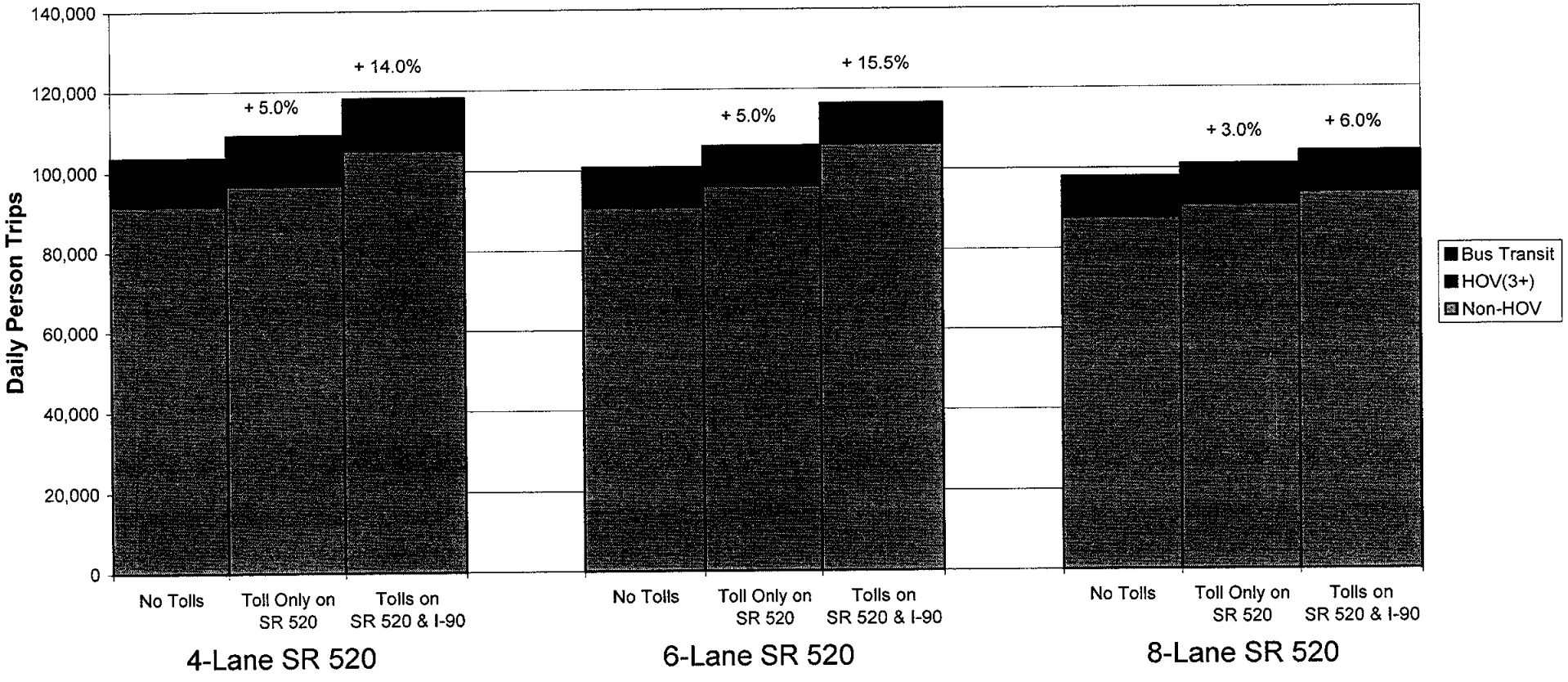
SR 520 with 4-Lane, 6-Lane and 8-Lane Options

Figure 2
Daily Person Trip Comparison on I-90



SR 520 with 4-Lane, 6-Lane and 8-Lane Options

Figure 3
Daily Person Trip Comparison on SR-522



SR 520 with 4-Lane, 6-Lane and 8-Lane Options

Vehicle Throughput

The total demand for vehicular trips on the three facilities for the two pricing concepts is illustrated in Figures 4, 5, and 6. These figures summarize the total daily HOV and non-HOV (SOV) vehicle trip activity and compares daily vehicular travel demand on SR 520, I-90, and SR 522 across the three different alternatives (4 Lane, 6 Lane and 8 Lane) under the "No Toll" and Toll scenarios. The Appendix to this report provides detailed forecasts by mode of travel for the different alternatives under the "No Toll" and Toll scenarios.

Observations – Toll on SR 520 Only

Non-HOV Trips - irrespective of the number of lanes on SR 520, the application of tolls on SR 520 results in a reduction of about 23% of the daily non-HOV trips using SR 520. On the other hand, I-90 shows increases of between 8% and 11% in non-HOV trip activity, and SR 522 also increases of about 4% to 6%.

HOV Trips – tolls on SR 520, result in an increase of almost 17% of HOV trips on SR 520. HOV trips on I-90 decrease by about 4%, while SR 522 shows no change in HOV trip activity.

Observations – Toll on SR 520 and I-90

Non-HOV Trips - the application of tolls on both SR 520 and I-90 show reductions in daily non-HOV trips across both SR 520 and I-90, while SR 522 shows an increase in SOV trip activity. SR 520 shows the most reduction of SOV trips, in the order of 14% to 16%, while, I-90 shows a reduction of between 6% and 12%. On the other hand, SR 522 shows an increase in non-HOV trip activity ranging between 7% and 17%.

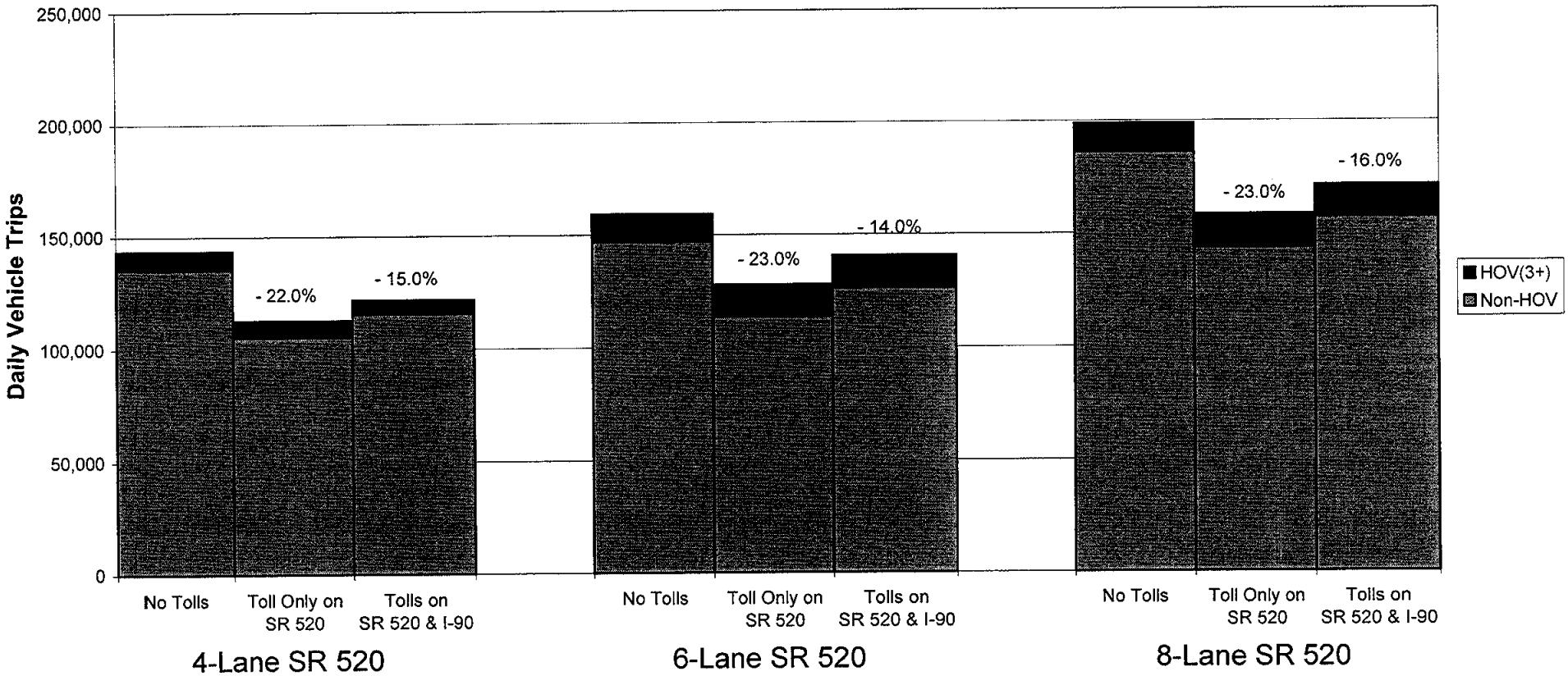
HOV Trips – tolls on both SR 520 and I-90 result in an increase of between 13% and 15% of HOV trips on SR 520, while I-90 shows a decrease of between 5% and 9% in HOV trip activity. SR 522 shows no change in HOV trip activity.

Summary

The introduction of value pricing on Lake Washington crossings leads to an overall reduction of between 16% and 23% of non-HOV trips on SR 520 and I-90, while, SR 522 shows increases in non-HOV trips ranging from 4% to 17%. With respect to HOV trips, SR 520 experiences increases ranging between 13% and 17% in HOV trip activity, while, I-90 shows a decrease of about 5% to 9% in HOV trip activity, and SR 522 shows no change.

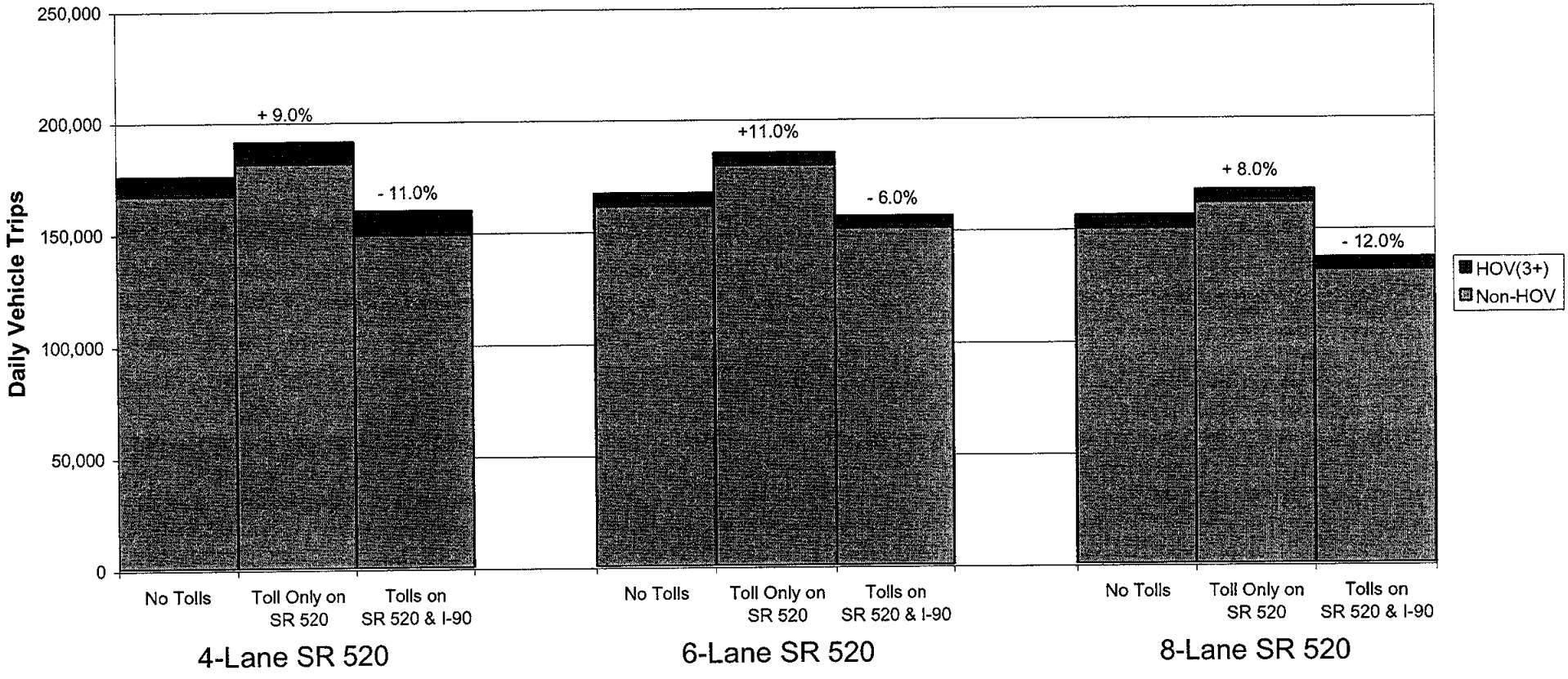
To conclude, the introduction of tolls result in a reduction of non-HOV trips crossing the Lake on SR 520 and I-90, accompanied by an increase in SOV trips going around the Lake on SR 522. There is also an increase in the total number of HOV trips crossing the Lake on both SR 520 and I-90, with SR 520 being the preferred crossing for the majority of HOV trips.

Figure 4
Daily Vehicle Trip Comparison on SR-520



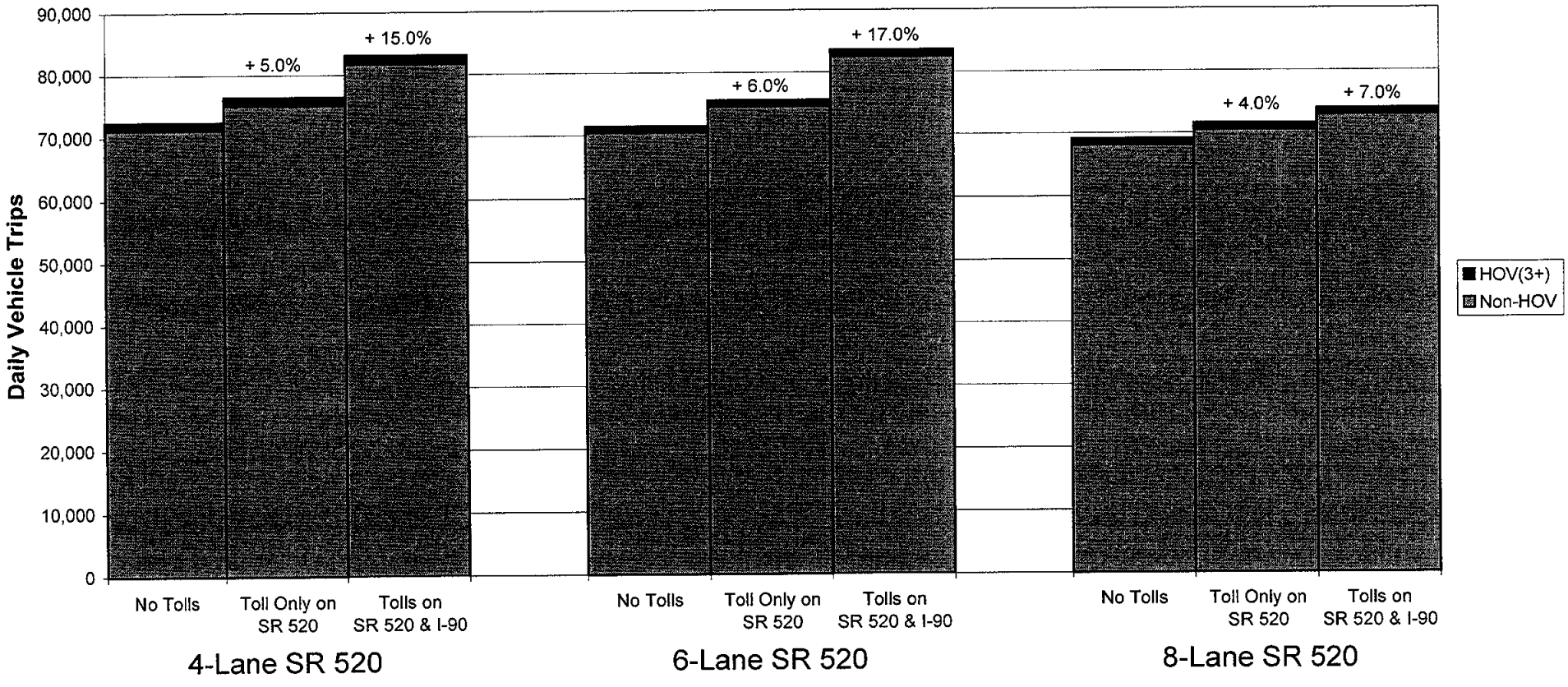
SR 520 with 4-Lane, 6-Lane and 8-Lane Options

Figure 5
Daily Vehicle Trip Comparison on I-90



SR 520 with 4-Lane, 6-Lane and 8-Lane Options

Figure 6
Daily Vehicle Trip Comparison on SR-522



SR 520 with 4-Lane, 6-Lane and 8-Lane Options

Traffic Diversion

Changes in the daily travel pattern of vehicular trips are presented in Figures 7 and 8. Figure 7 illustrates the daily travel patterns of vehicular trips resulting from the application of tolls on SR 520, while Figure 8, illustrates the daily travel patterns resulting from the application of tolls on both SR 520 and I-90. It should be noted that these changes in daily travel patterns are based on a comparison of model results from the "No Toll" and "Toll" scenarios respectively.

Observations – Toll on SR 520 Only

Daily Travel Patterns - irrespective of the number of lanes on SR 520, the application of tolls on SR 520, result in a reduction of almost 20% of the daily vehicle trips on SR 520, as shown in Figure 7. In addition to the general reduction of trips on SR 520, the following daily traffic patterns results from value pricing SR 520 only:

- 9% increase in vehicle trips on I-90;
- 6% increase in vehicle trips on SR 522;
- 1% to 2% increase in vehicle trips on I-405 (south of the Trans-Lake corridor); and,
- 3% to 5% increase in vehicle trips on arterial roadways in Seattle, Bellevue, Kirkland, Redmond, and the Points Communities.

Observations – Toll on SR 520 and I-90

Daily Travel Patterns - irrespective of the number of lanes on SR 520, the application of tolls on SR 520 and I-90, result in a reduction of nearly 13% to 14% of the daily vehicle trips on I-90 and SR 520, as shown in Figure 8. In addition, the following daily traffic patterns results from value pricing SR 520 and I-90:

- 7% to 17% increase in vehicle trips on SR 522;
- 3% to 5% increase in vehicle trips on I-405 (south of the Trans-Lake corridor); and
- 5% to 10% increase in vehicle trips on arterial roadways in Seattle, Bellevue, Kirkland, Redmond, and the Points Communities.

Summary

The introduction of value pricing on SR 520 and I-90 results in an increase of 7% to 17% of the daily vehicle trips on SR 522, accompanied by a 3% to 10% increase in daily vehicle trips on arterial roadways in Seattle, Bellevue, Kirkland, Redmond, and the Points Communities.

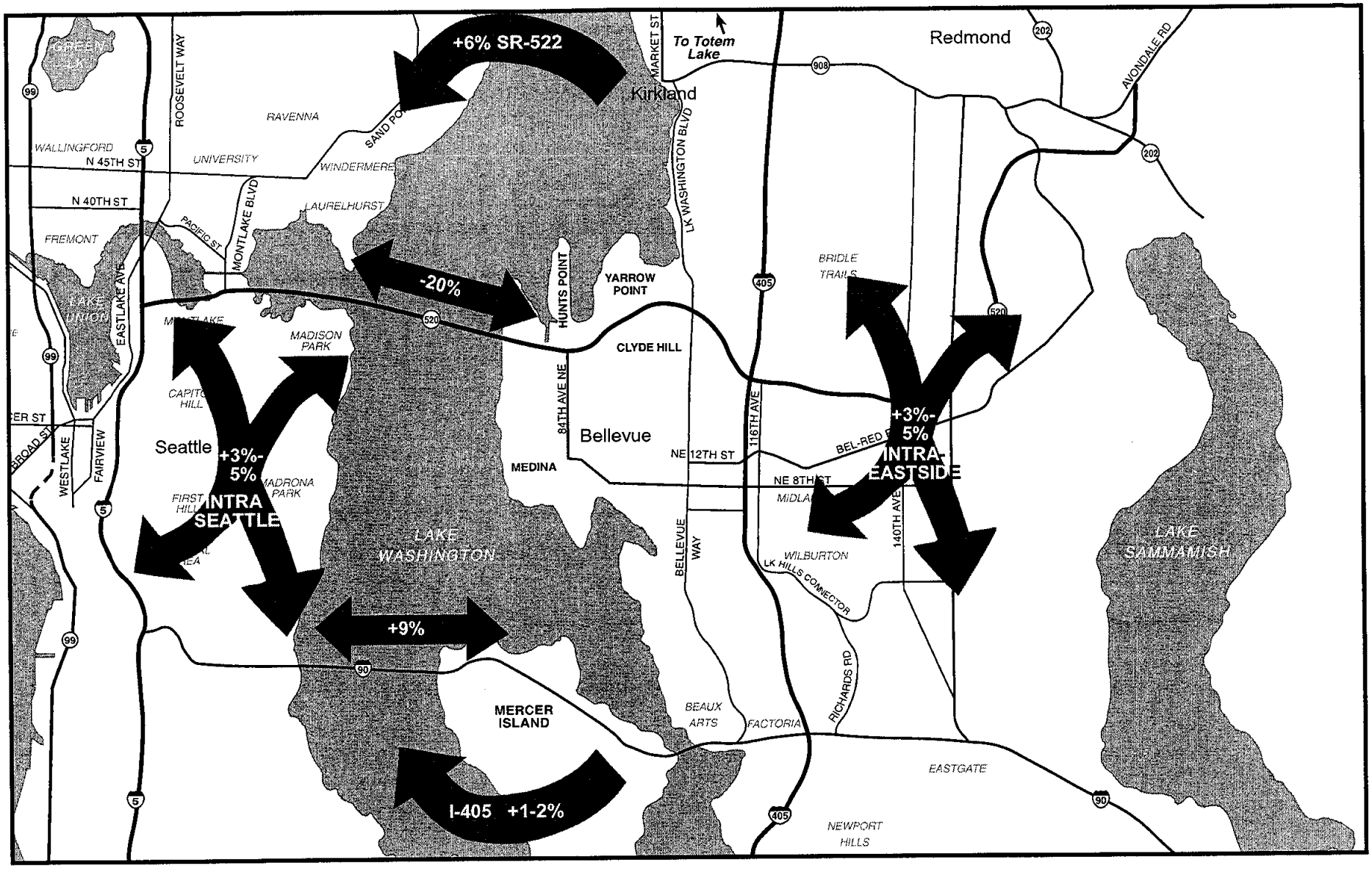


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Figure 7
Daily Travel Pattern Changes
Pricing on SR-520

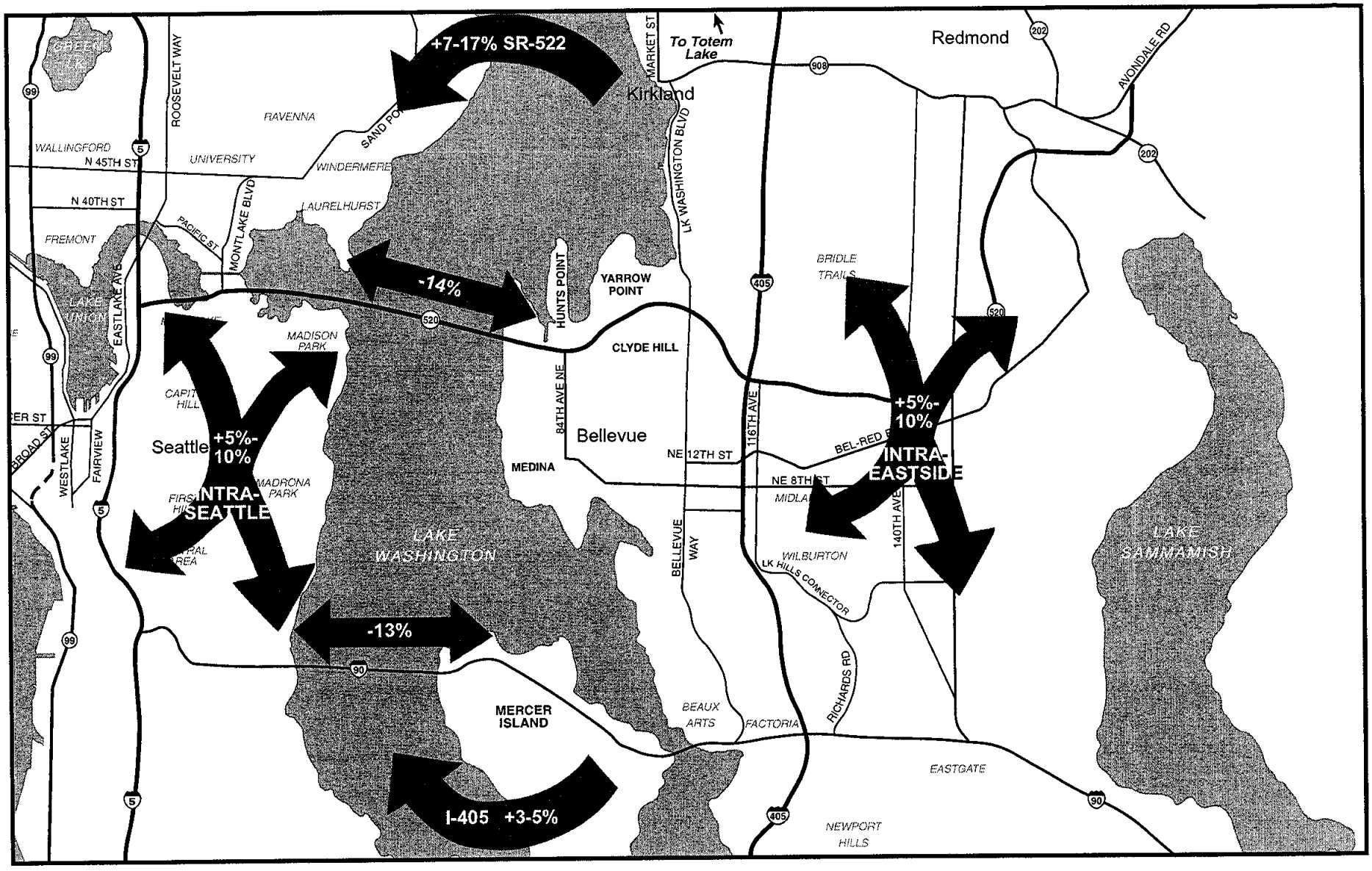

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Figure 8
Daily Travel Pattern Changes
Pricing on SR-520 & I-90

Volume to Capacity (V/C) Ratios and Speeds

The following is a discussion on changes in volume to capacity (V/C) ratios and operating speeds on the Lake Washington bridge under the "No Toll" and Toll conditions. Figures 9 thru 17, display changes to V/C ratios and operating speeds for the 4, 6, and 8 Lane alternatives.

Calculation of V/C Ratios and Speeds

The V/C ratios and speeds for the SR 520 bridge under the 4, 6, and 8 Lane alternatives was calculated based on the following assumptions:

- 2030 daily traffic forecasts for the 4, 6, and 8 Lane alternatives under the "No Toll" and "Toll" conditions served as the starting point for this analysis.
- Existing daily traffic volume distribution on SR 520 (near 76th Street) was used to generate the future hourly traffic volume distribution for the general purpose lanes and the HOV lanes.
- The 4 Lane alternative assumes a lane capacity of 2000 vehicles per hour for the general purpose lanes under the 4 Lane alternative.
- The 6 Lane alternative assumes a higher lane capacity of 2100 vehicles per hour. The added capacity reflects improvements to the SR 520 bridge, i.e., shoulder width, standard lane width, and improved sight distance.
- The 8 Lane alternative assumes a lane capacity of 2200 vehicles per hour per lane. In this case a slightly higher capacity per lane was assumed to take into account the two additional lanes that are being considered on the SR 520 bridge, in addition to the standard improvements to shoulder width, lane width, and improved sight distance.
- A HOV lane capacity of 1800 vehicles per hour for the 6 and 8 Lane alternatives.
- Buses were converted to passenger car equivalents (PCE) and added to the general purpose lane volumes under the 4 Lane alternative, and to the HOV lane volumes for the 6 and 8 Lane alternatives.
- A PCE conversion factor of 3.1 was used. This assumes 50 percent of the buses to be articulated with a PCE of 4 and the remainder to be single unit buses with a PCE factor of 2.2.
- 2030 general purpose traffic volumes were converted to PCEs assuming 5% heavy vehicles with a PCE factor of 2.2.

Observations – Toll on SR 520 Only

Figure 9 presents V/C ratios and operating speeds on the Lake Washington bridge for the 4 Lane alternative under the "No Toll" scenario, while Figure 10 presents the same information under toll conditions. Introduction of tolls on SR 520 shows a 20% reduction in V/C ratios (from 1.40 to 1.10) during the peak periods, resulting in an increase in operating speeds from below 10 mph to about 20 mph. A similar reduction in V/C ratios (from 1.15 to 0.90) is observed during the off-peak period, with operating speeds improving from 10 mph to 60 mph.

Similar trends in V/C ratios and operating speeds are observed with the 6 Lane alternative. Figures 12 and 13 present changes in V/C ratios and speeds from the 6 Lane alternative. Tolls on SR 520 result in a 24% reduction in V/C ratios during the peak periods (from 1.25 to 0.95), with operating speeds on the general purpose lanes increasing from below 10 mph to 55 mph during peak period conditions. During the off-peak period the V/C ratios drop by about 22% (from 1.15 to 0.90) and operating speeds on the general purpose lanes improve from below 20 mph to 60 mph.

The 8 Lane alternative shows trends in V/C ratios similar to the 4 and 6 Lane alternatives, however, the improvement to operating speeds are not as much as that observed with the 4 and 6 Lane alternatives. Figures 15 and 16 present changes in V/C ratios and speeds from the 8 Lane alternative. In this case, tolls on SR 520 result in a 20% reduction in V/C ratios during the peak periods (from 1.00 to 0.80), with operating speeds on the general purpose lanes improving from 45 mph to 60 mph. During the off-peak period the V/C ratios drop by about 22 % (from 0.90 to 0.70), however, there is no change in the operating speeds on the general purpose lanes. This is because the V/C ratios and operating speeds from the 8 Lane alternative under the "No Toll" conditions shows peak period congestion levels much lower than that compared to the 4 and 6 Lane alternatives. In other words, the greater the congestion is during peak periods (high V/C ratios and low speeds) under "No Toll" conditions, the larger the resulting change in V/C ratios and operating speeds from the introduction of tolls.

On the other hand, operating conditions on HOV lanes in the Trans-Lake corridor lanes do not deteriorate when either the 4, 6 or 8 lane alternatives are tolled. V/C ratios on HOV lanes are below 0.80 with operating speeds of 55 mph to 60 mph.

Observations – Toll on SR 520 and I-90

Changes to V/C ratios and operating speeds on the Lake Washington bridge when both SR 520 and I-90 are tolled is presented in Figures 11, 14, and 17.

As shown in Figures 9 and 11, toll on SR 520 and I-90 under the 4 Lane alternative results in a 15% reduction in V/C ratios during the peak periods (from 1.40 to 1.20), with no change in operating speeds on SR 520. A similar reduction of about 17% in V/C ratios (from 1.15 to 0.95) is observed during the off-peak period, with operating speeds on SR 520 improving from 10 mph to 55 mph.

Figures 12 and 14, show changes in V/C ratios and operating speeds from the 6 Lane alternative. Tolls on SR 520 and I-90 result in a 15% reduction in V/C ratios during the peak periods, with operating speeds on the general purpose lanes improving from below 10 mph to about 20 mph. During the off-peak period the V/C ratios improve by about 18% (from 1.15 to 0.95), and operating speeds on the general purpose lanes improve from 20 mph to 55 mph.

Figures 15 and 17, show changes in V/C ratios and operating speeds from the 8 Lane alternative. Tolls on SR 520 and I-90 result in a 15% reduction in V/C ratios during the peak periods (from 1.0 to 0.85), with operating speeds on the general purpose lanes improving from about 45 mph to 60 mph. During the off-peak period the V/C ratios drop by 17% (from 0.90 to 0.75), however, there is no change in the operating speeds on the general purpose lanes. They continue to operate at free-flow conditions of 60 mph. Once again, because of the low levels of congestion observed during the peak and off-peak period from the 8 Lane alternative with no tolls, the response to tolls from this alternative is not as much as that reflected in the 4 and 6 Lane alternatives.

As with the case of tolling SR 520 only, operating conditions on HOV lanes in the Trans-Lake corridor lanes do not deteriorate when either the 4, 6 or 8 lane alternatives are tolled. V/C ratios on HOV lanes are below 0.80 with operating speeds of 55 mph to 60 mph.

Summary

Value pricing has an impact on the V/C ratios and operating speeds on SR 520. Tolls on SR 520 and I-90 will provide a 15% to 24% improvement in V/C ratios accompanied by improved operating speeds on the general purpose lanes. On the other hand, In general, the improvement to V/C ratios and operating speeds on the SR 520 corridor varies with the level of congestion experienced. In other words, the greater the congestion is during peak periods (high V/C ratios and low speeds) under "No Toll" conditions, the larger the resulting change in V/C ratios and operating speeds from the introduction of tolls.

Figure 9
Year 2030 Mid-Lake SR-520 V/C Ratio and Speed
4-Lane Alternative - No Toll

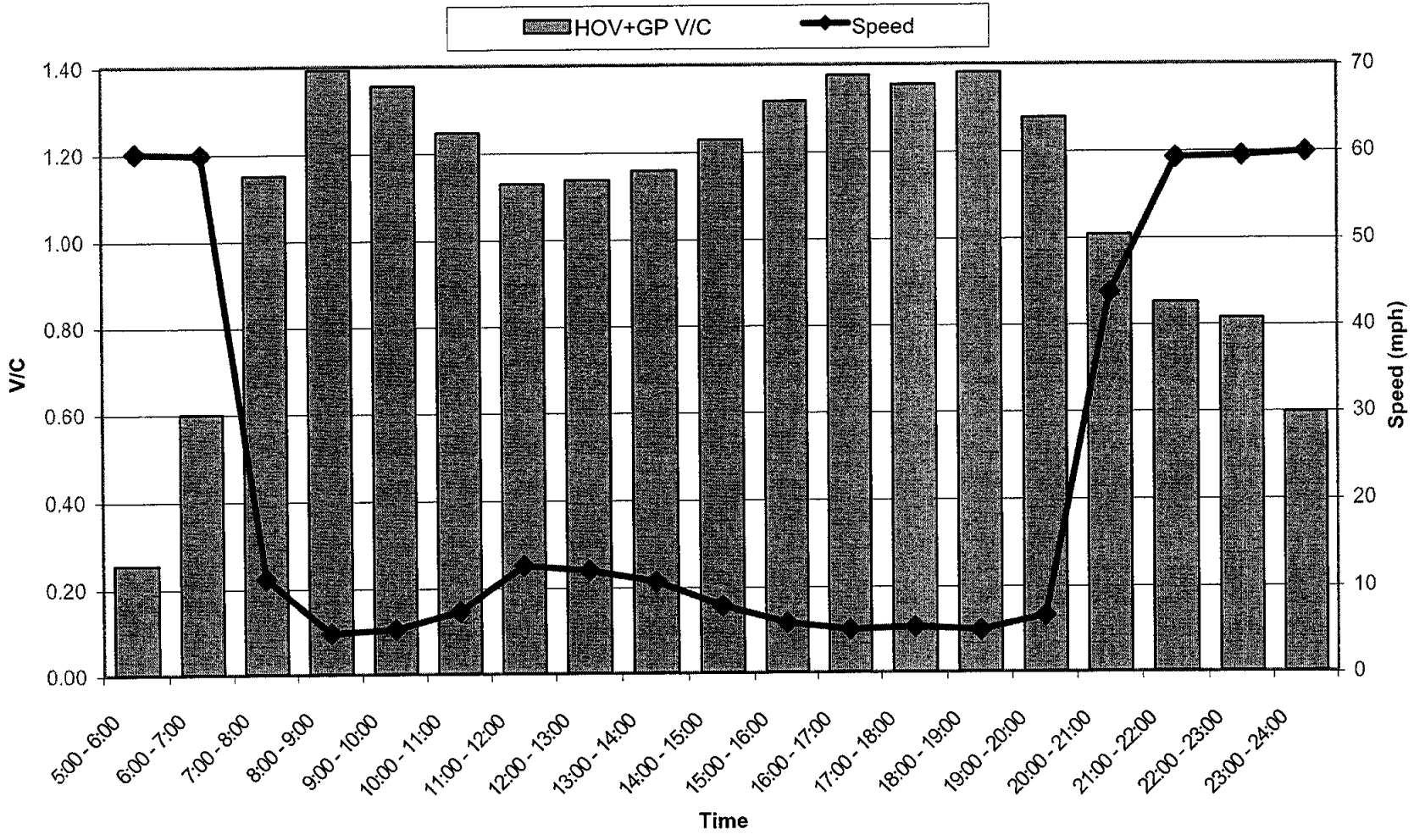


Figure 10
Year 2030 Mid-Lake SR-520 V/C Ratio and Speed
4-Lane Alternative - Toll on SR-520

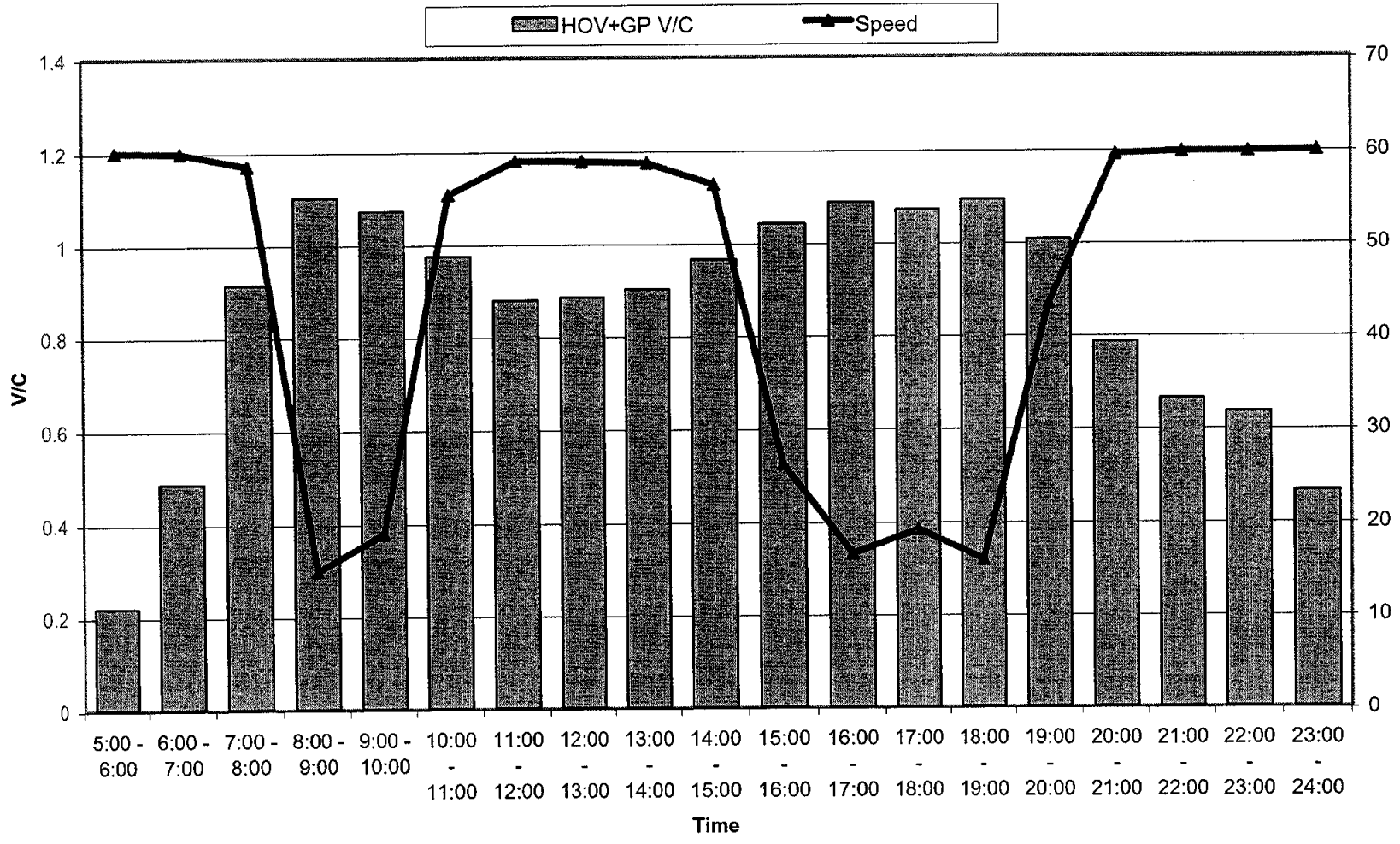


Figure 11
Year 2030 Mid-Lake SR-520 V/C Ratio and Speed
4-Lane Alternative - Toll on SR-520 & I-90

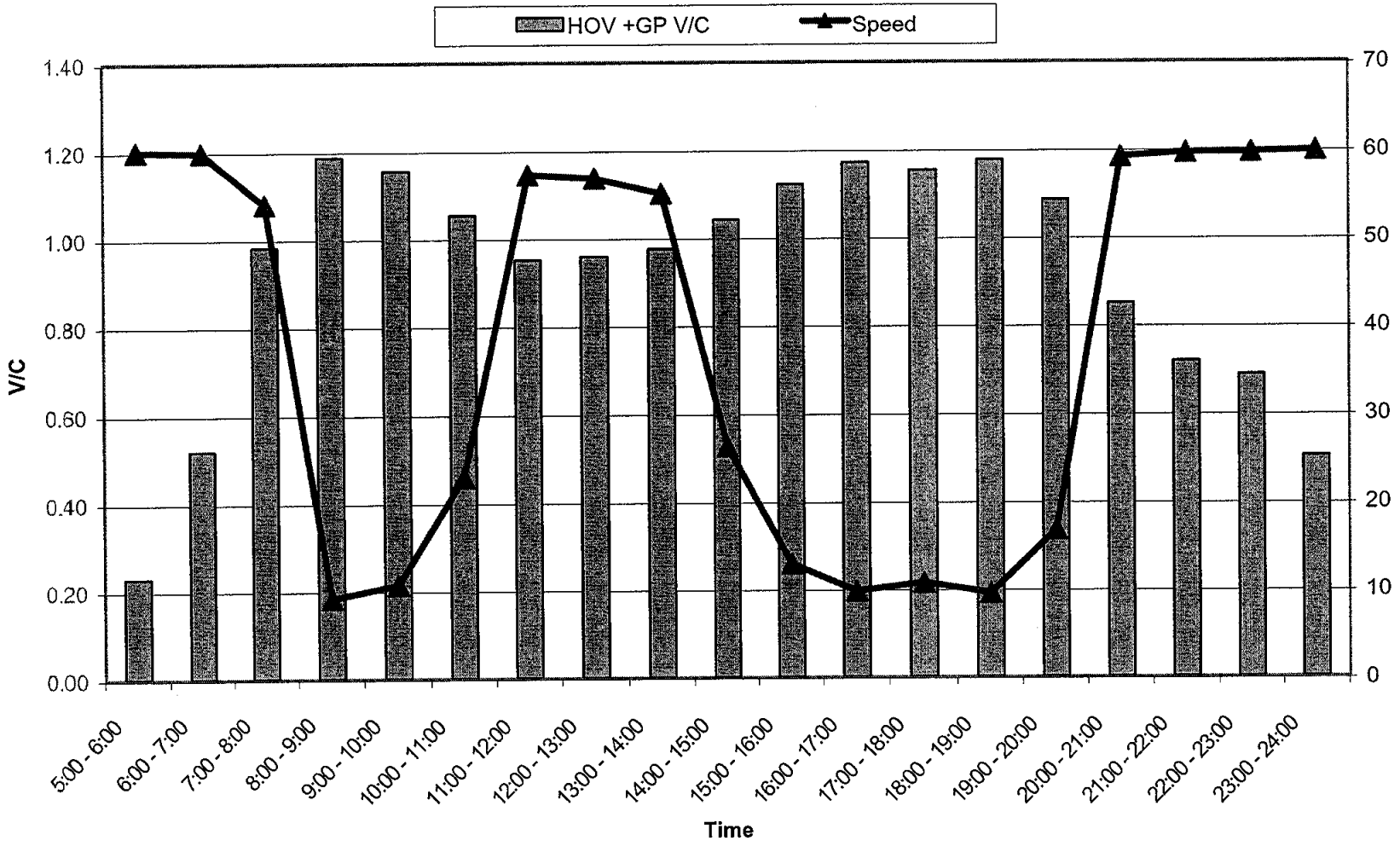


Figure 12
Year 2030 Mid-Lake SR-520 V/C Ratio and Speed
6-Lane Alternative - No Toll

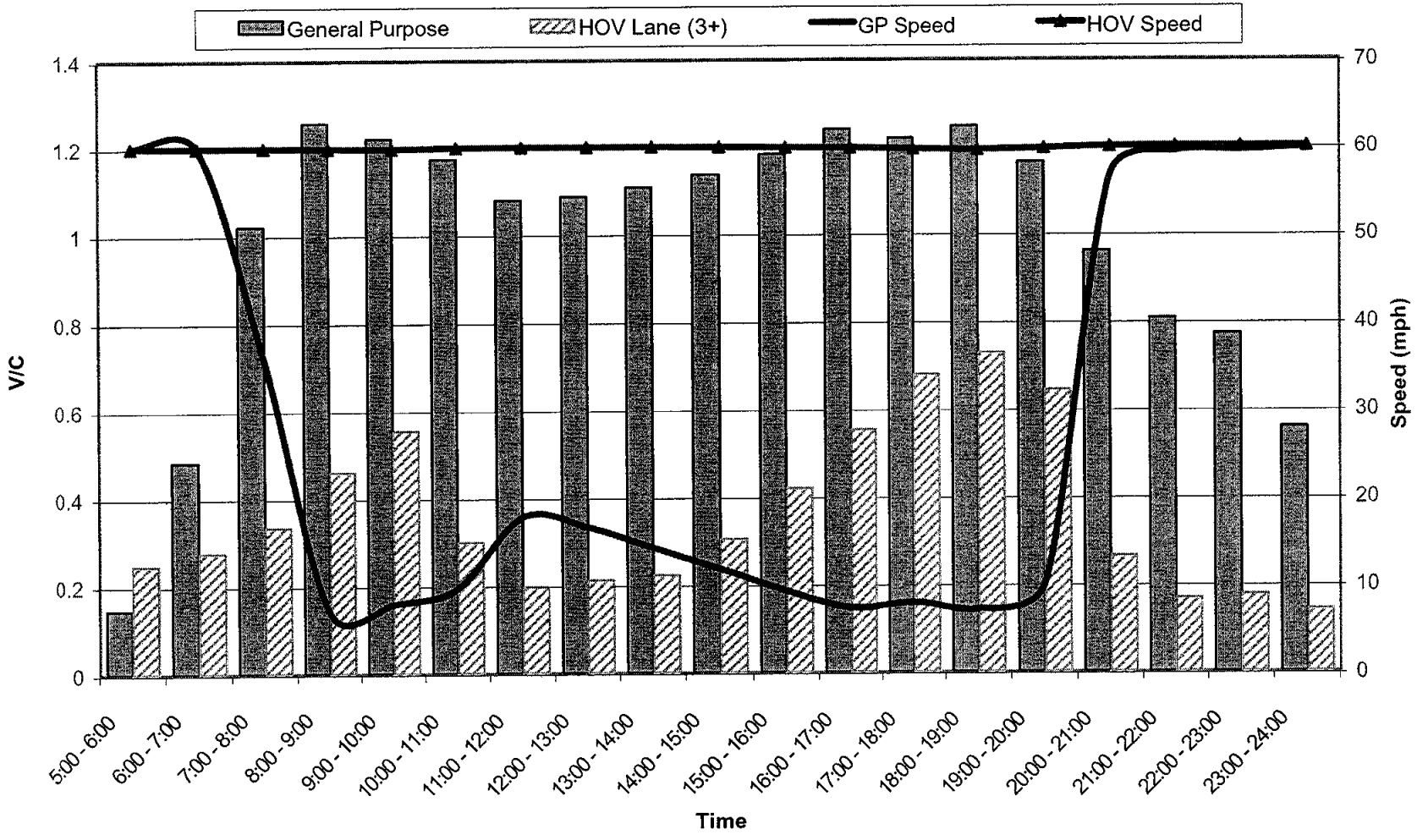


Figure 13
Year 2030 Mid-Lake SR-520 V/C Ratio and Speed
6-Lane Alternative - Toll on SR-520

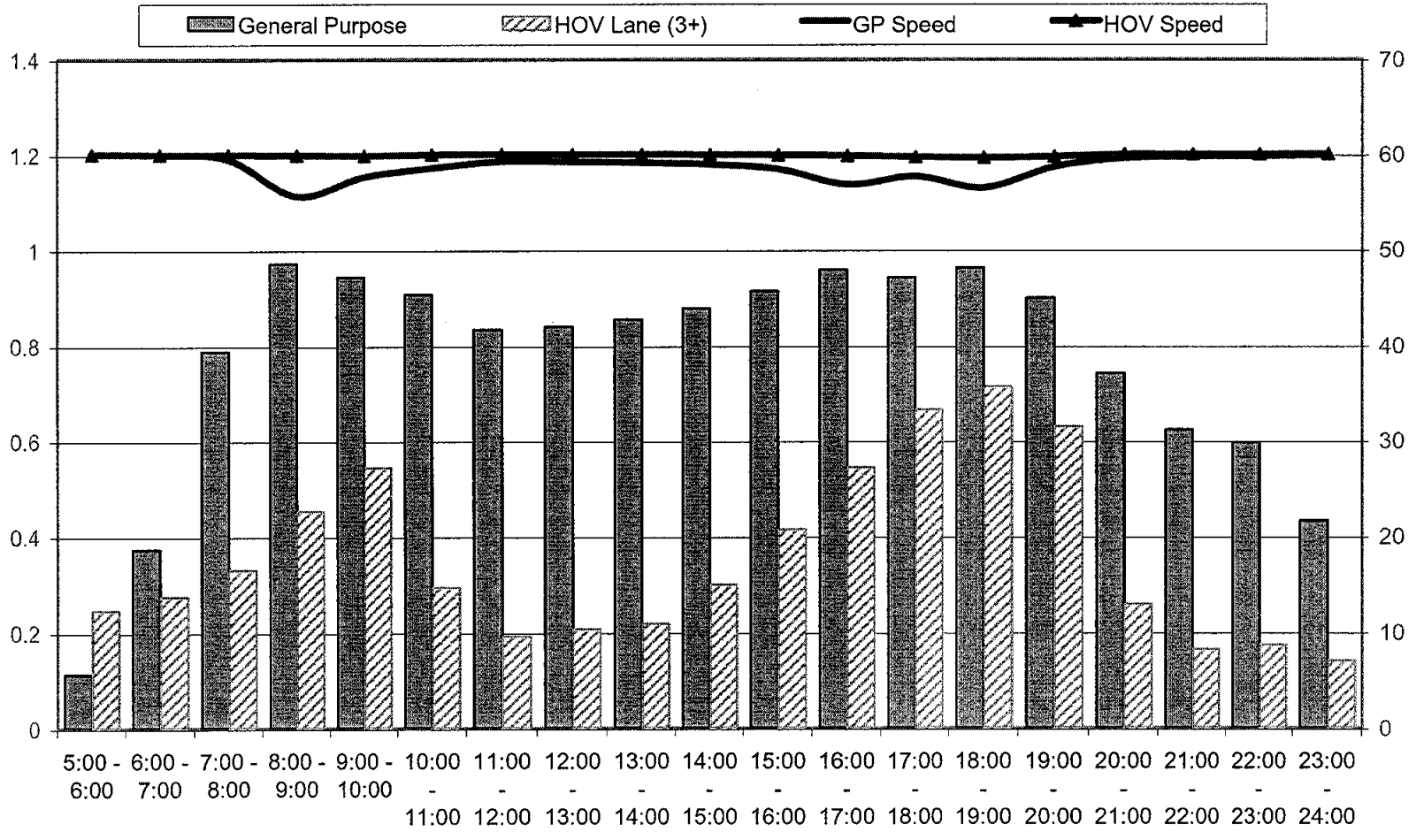


Figure 14
Year 2030 Mid-Lake SR-520 Volume to Capacity Ratio
6-Lane Alternative - Toll on SR-520 & I-90

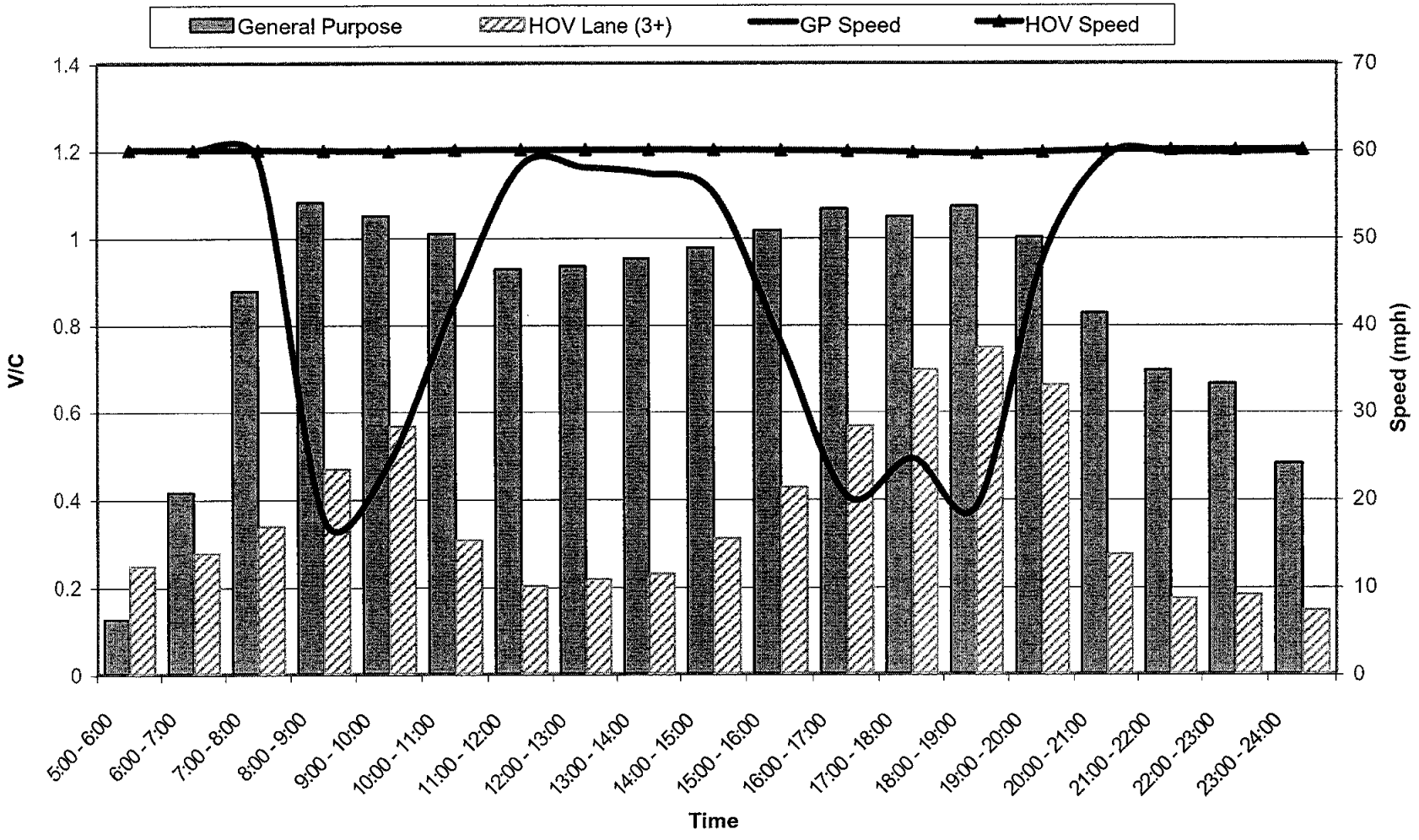


Figure 15
Year 2030 Mid-Lake SR-520 V/C Ratio and Speed
8-Lane Alternative - No Toll

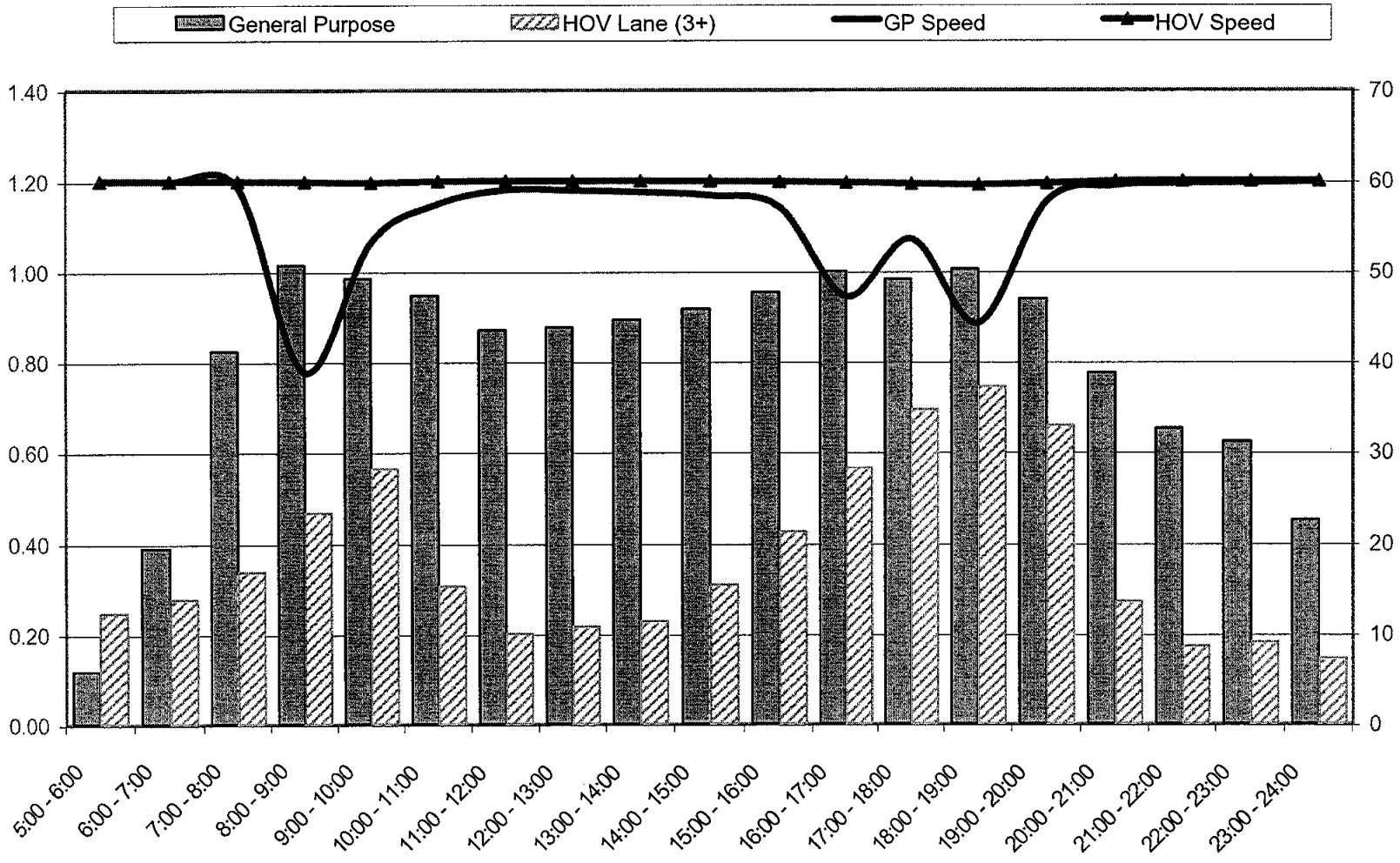


Figure 16
Year 2030 Mid-Lake SR-520 V/C Ratio and Speed
8-Lane Alternative - Toll on SR-520

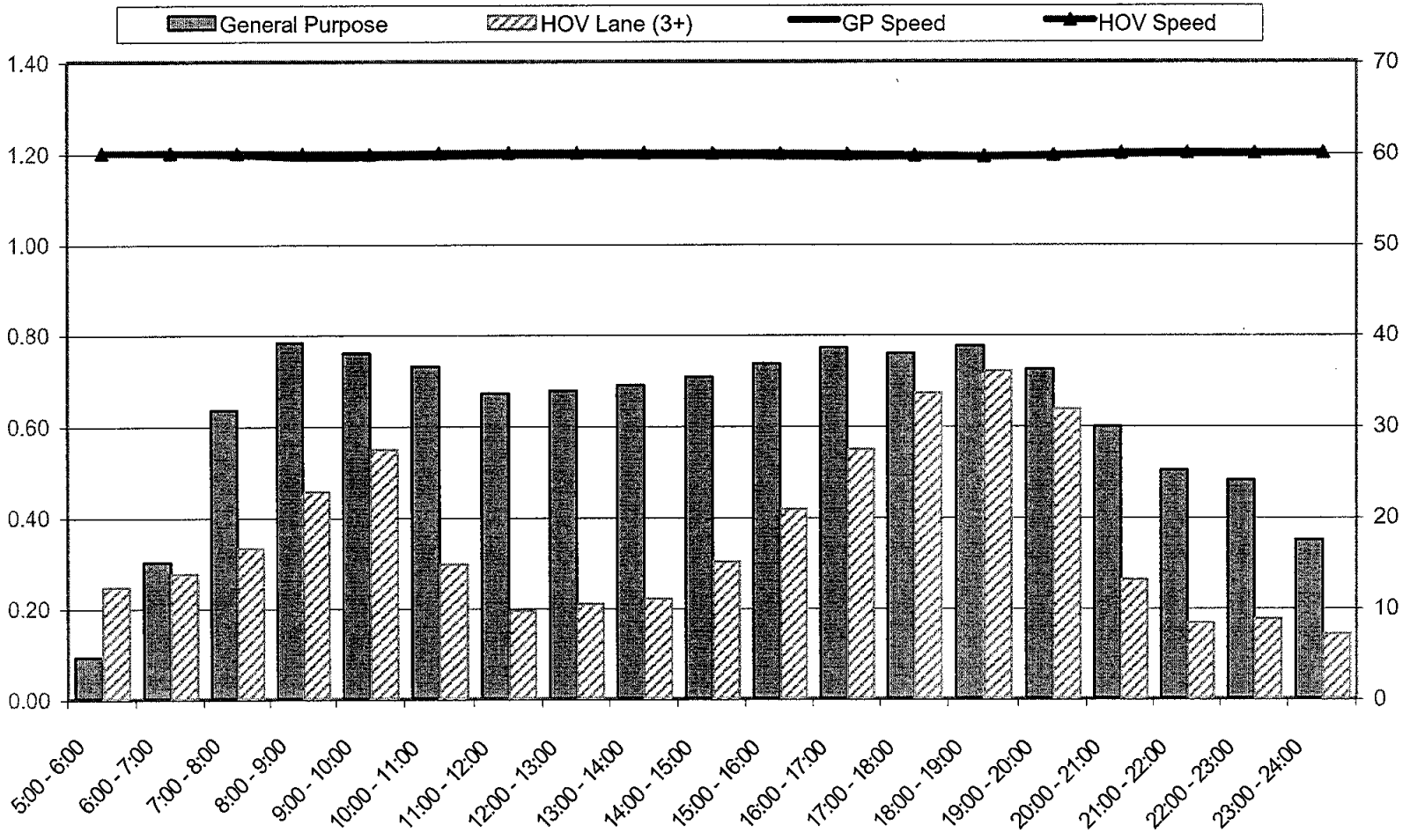
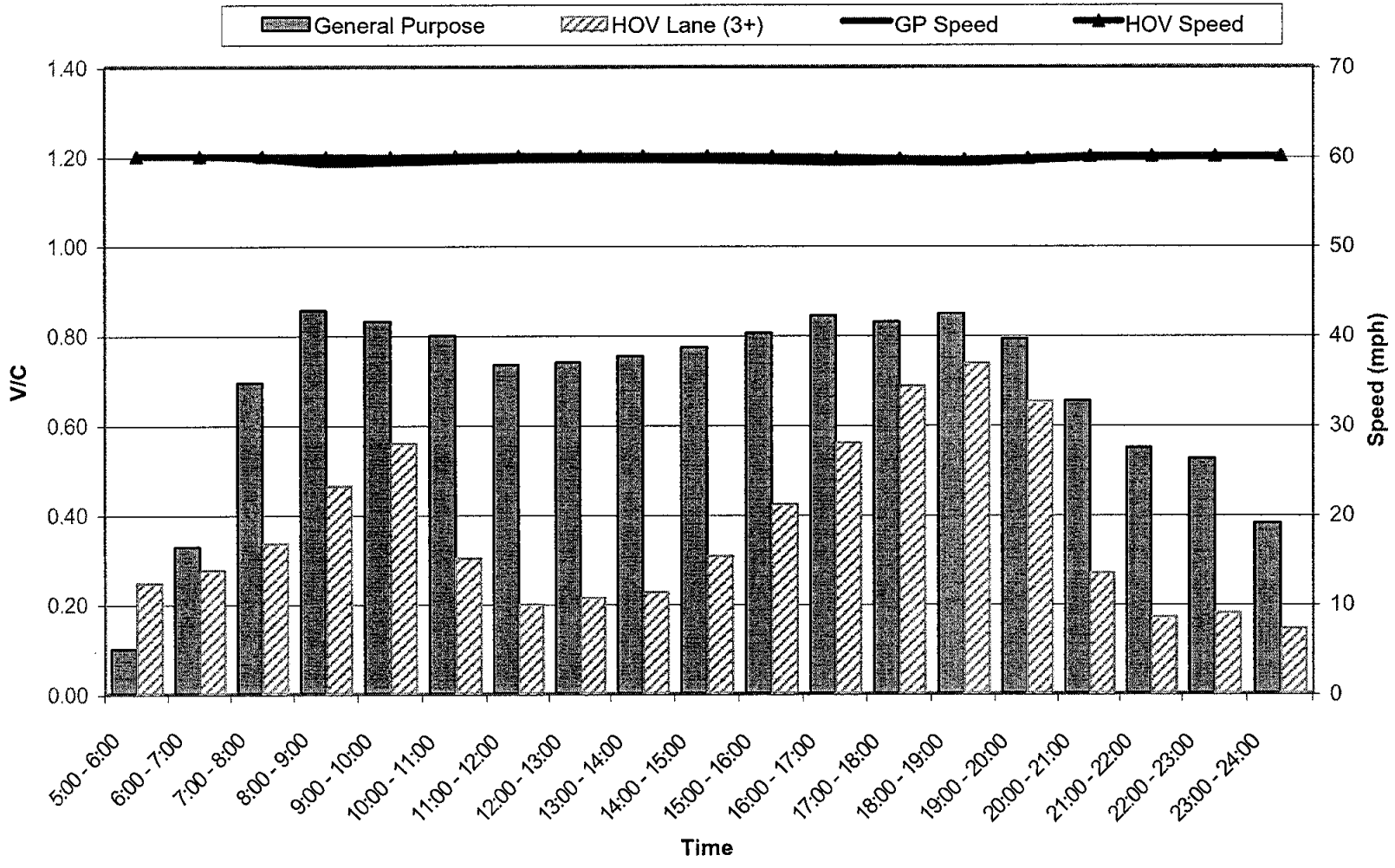


Figure 17
Year 2030 Mid-Lake SR-520 V/C Ratio and Speed
8-Lane Alternative - Toll on SR-520 & I-90



Mode Share

The mode share analysis focuses on the percentage of trips made by HOV, Non-HOV, and Transit modes for each of the 4, 6, and 8 Lane alternatives. This information is derived from the PSRC model person trip forecasts, and is provided in detail in the Appendix to this memorandum. Table 4 provides a summary of the modal shifts resulting from the application of tolls to cross-Lake Washington trips.

Table 4: 1998 and 2030 Daily Mode Shares on SR 520 With and Without Toll

Alternative	HOV Trips	Transit Trips	Non-HOV Trips
Existing (1998)	2.0 percent	6.0 percent	92.0 percent
4 Lane Alternative (2030):			
– No Toll	10.9 percent	15.5 percent	73.6 percent
– Toll on SR 520	11.7 percent	21.1 percent	67.2 percent
– Toll on SR 520 & I-90	9.3 percent	20.2 percent	70.5 percent
6 Lane Alternative (2030):			
– No Toll	14.2 percent	18.5 percent	67.3 percent
– Toll on SR 520	18.3 percent	24.0 percent	57.7 percent
– Toll on SR 520 & I-90	17.2 percent	22.2 percent	60.6 percent
8 Lane Alternative (2030):			
– No Toll	12.2 percent	16.3 percent	71.5 percent
– Toll on SR 520	16.3 percent	20.7 percent	63.0 percent
– Toll on SR 520 & I-90	15.1 percent	19.4 percent	65.5 percent

Observations – Toll on SR 520 Only

With tolls on SR 520, HOV trips increase by 1% to 4%, and transit trips increase by 4% to 6%, compared to 2030 conditions without tolls. As shown in Table 4, the highest mode shift of almost 10% (4% HOV and 5.5% Transit) occurs with the 6 Lane alternative, while the 8 Lane and 4 Lane alternatives show modal shifts of 8.50% and 6% respectively.

Observations – Toll on SR 520 and I-90

When both SR 520 and I-90 are tolled, the response to modal shifts is lower than that resulting from when only SR 520 is tolled. As shown in Table 4, the 6 Lane alternative still has the highest mode shift of about 6.50% (3% HOV and 3.5% Transit), while the 8 Lane and 4 Lane alternatives show modal shifts of 6% and 3% respectively, compared to 2030 conditions without tolls.

Summary

The introduction of value pricing on SR 520 and I-90 result in increases in HOV and transit trips crossing Lake Washington. The largest mode shift of 6% to 10% from non-HOV modes to HOV and transit modes is observed under the 6 Lane alternative, while the 8 and 4 Lane alternatives show mode shifts ranging between 8.5% and 3.0%, compared to 2030 conditions without tolls.

Evaluation of the Managed Lanes Alternative

The following discussion presents the results from modeling the 8 Lane - Managed Lanes alternative. The performance of the Managed Lane alternative in comparison to the 8 Lane Base alternative (without toll) is presented below. This includes an analysis of the travel demand and traffic operations, i.e., V/C ratios and speeds on the SR 520 corridor.

The 8 Lane – Managed Lanes alternative as illustrated in Figure 18, consists of 4 general purpose lanes and 4 HOV lanes along the SR 520 corridor. The management component of this alternative relates primarily to managing access to the HOV lanes. This alternative provides free access to all HOV 3+ and transit users along the corridor, as well as, limited access to HOV 2 users. HOV 2 users will pay a toll to access the managed lanes at the following locations:

- Montlake Blvd.
- Bellevue Way/104th Avenue NE (direct HOV access ramps)
- I-405 (via freeway-to-freeway HOV ramps)
- Vicinity of NE 32nd Street (direct HOV access ramps near Overlake)
- SR 202 (east terminus)

These access points to the managed lanes were selected primarily because they serve as gateways to key activity centers (University of Washington and Bel-Red Overlake area), as well as direct access points for transit to access and egress the corridor. In addition, an HOV slip ramp to/from the mainline was assumed between 84th Avenue NE and 92 Avenue NE.

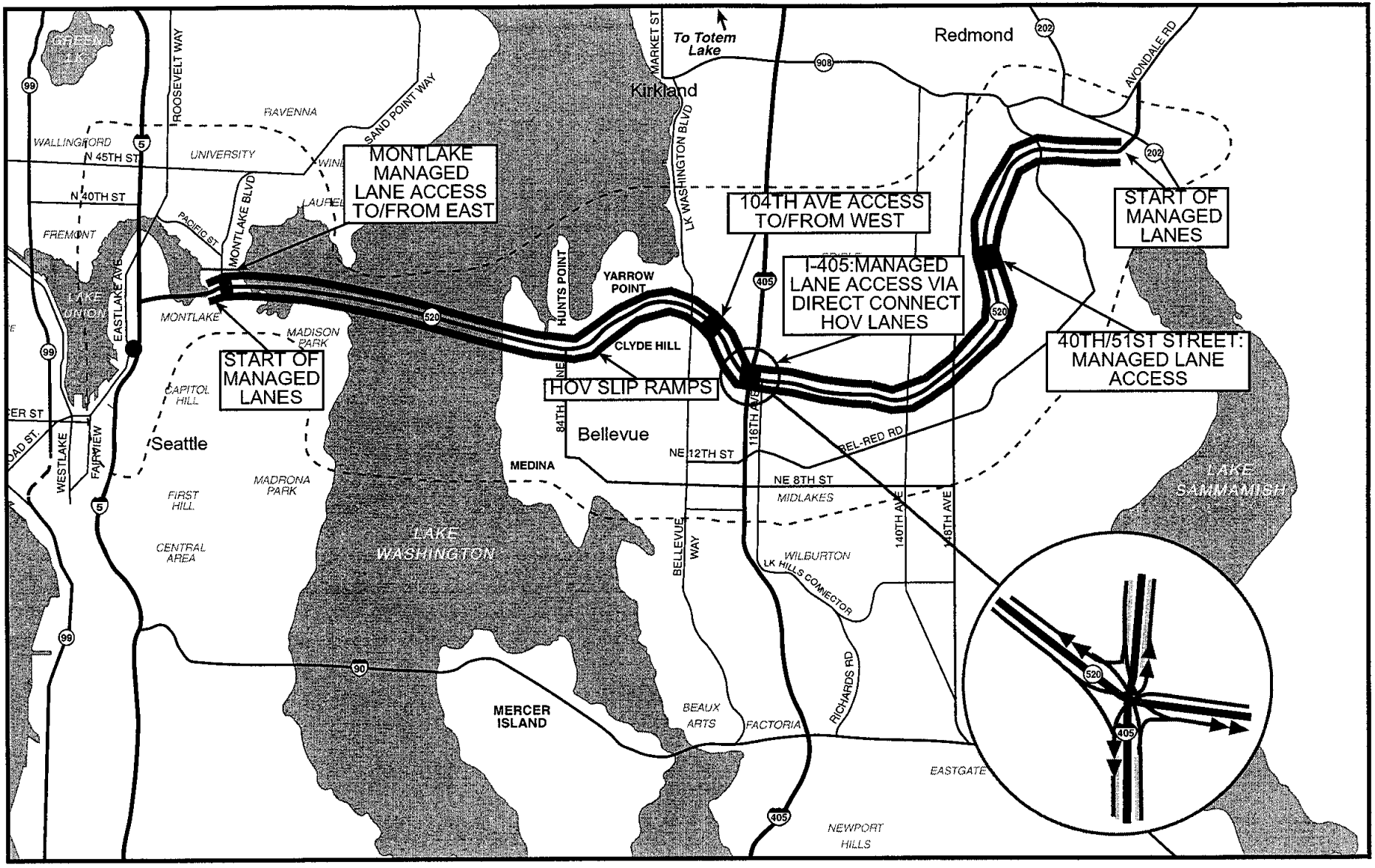
The extent of the analysis is limited to the evaluation of cross-Lake Washington traffic patterns on SR 520 across the following four screenline locations:

- Lake Washington Bridge
- East of Bellevue Way NE and West of I-405
- East of I-405 and West of 124th Avenue NE
- North of NE 51st Street and West of W. Lake Sammamish Parkway

Travel Demand

The vehicle travel demand at four locations along the SR 520 corridor is shown in Table 5. The table compares the AM and PM peak periods, off-peak period, and daily vehicle trips across four screenlines from the Managed Lane alternative against the 8 Lane Base alternative. A general observation is that while vehicle throughput in the managed HOV lanes increased across all four screenlines, the demand on the mainline decreased. This is primarily due to the conversion of 2 general purpose lanes from the 8 Lane Base alternative to HOV and transit only lanes in the 8 Lane - Managed Lanes alternative.

HOV travel demand showed significant increases across all the screenlines, with the highest increases of nearly 300% being recorded on the 2 screenlines west of I-405, and the screenline at NE 51st Street (Redmond). Non-HOV travel demand showed significant decreases of nearly 20% across the 2 screenlines west of I-405, and about 10% across the NE 51st Street screenline.



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- Study Area Boundary
- Access Locations
- Managed Lanes
- HOV Lanes
- GP Lanes

Figure 18
Managed Lanes Access Points

Table 5: Vehicle Travel Demand – Managed Lane Alternative

	SR 520 - 8 Lane Alternative (with Managed Lanes)			SR 520 - 8 Lane Alternative (without Managed Lanes)			Change in Total Volume	Percent Change from PA
on SR 520 Lake Washington Bridge	Mainline	Managed Lanes	Total	GP Lane	HOV (3+) Lane	Total		
AM Peak (3 hours)	27,400	11,500	38,900	35,200	4,200	39,400	(500)	-1%
PM Peak (3 hours)	34,600	10,300	44,900	45,100	3,400	48,500	(3,600)	-7%
Off Peak (18 hours)	85,700	15,400	101,100	106,300	5,100	111,400	(10,300)	-9%
Total Daily (24 hours)	147,700	37,200	184,900	186,600	12,700	199,300	(14,400)	-7%
on SR 520 East of Bellevue Way NE and West of I-405 (Kirkland)								
AM Peak (3 hours)	23,000	8,500	31,500	27,900	3,000	30,900	600	2%
PM Peak (3 hours)	28,800	8,300	37,100	37,200	2,800	40,000	(2,900)	-7%
Off Peak (18 hours)	70,200	12,200	82,400	86,900	4,200	91,100	(8,700)	-10%
Total Daily (24 hours)	122,000	29,000	151,000	152,000	10,000	162,000	(11,000)	-7%
on SR 520 East of I-405 and West of 124th NE (Bellevue)								
AM Peak (3 hours)	20,700	4,700	25,400	22,200	3,200	25,400	-	0%
PM Peak (3 hours)	26,800	3,800	30,600	31,000	2,600	33,600	(3,000)	-9%
Off Peak (18 hours)	62,800	5,900	68,700	72,300	4,200	76,500	(7,800)	-10%
Total Daily (24 hours)	110,300	14,400	124,700	125,500	10,000	135,500	(10,800)	-8%
On SR 520 North of NE 51st and West of W Lake Sammamish (Redmond)								
AM Peak (3 hours)	29,700	4,100	33,800	32,900	1,600	34,500	(700)	-2%
PM Peak (3 hours)	38,500	3,800	42,300	43,600	1,200	44,800	(2,500)	-6%
Off Peak (18 hours)	99,000	5,300	104,300	107,500	2,000	109,500	(5,200)	-5%
Total Daily (24 hours)	167,200	13,200	180,400	184,000	4,800	188,800	(8,400)	-4%

The total travel demand across all four screenlines as shown in Table 6 for the AM, PM and off-peak periods, also shows a general decrease of about 4% to 8% in total trip activity on the SR 520 corridor. This primarily reflects the reduction in the overall demand for non-HOV trips along the corridor due to the decrease in general purpose capacity caused by the conversion of 2 general purpose lanes to 2 Managed lanes.

Table 6: Comparison of 2030 Daily Vehicle Trips

Screenline	8 Lane Base Alternative	8 Lane - Managed Lane Alternative	Difference
Lake Washington Bridge	199,300	184,900	- 14,400
East of Bellevue Way NE and West of I-405	162,000	151,000	- 11,000
East of I-405 and West of 124th Avenue NE	135,500	124,700	- 10,800
North of NE 51st and West of W. Lake Sammamish Pkwy.	188,800	180,400	- 8,400

Volume to Capacity (V/C) Ratios and Speeds

Figures 19 and 20 show the operating conditions on the SR 520 bridge for the 8 Lane Base alternative and the 8 Lane - Managed Lanes alternatives respectively.

Calculation of V/C Ratios and Speeds

The V/C ratios and speeds for the SR 520 bridge under the 8 Lane – Managed Lanes alternative was calculated based on the following assumptions:

- 2030 daily traffic forecasts from the 8 Lane – Base Alternative and the 8 Lane – Managed Lanes alternatives served as the starting point for this analysis.
- Existing daily traffic volume distribution on SR 520 (near 76th Street) was used to generate the future hourly traffic volume distribution for the general purpose lanes and the HOV lanes.
- The 8 Lane alternative assumes a lane capacity of 2200 vehicles per hour per lane. The higher capacity per lane was assumed to take into account the two additional lanes that are being considered on the SR 520 bridge, in addition to the standard improvements to shoulder width, lane width, and improved sight distance.
- A HOV lane capacity of 1800 vehicles per hour.
- Buses were converted to PCE and added to the HOV lane volumes.
- A PCE conversion factor of 3.1 was used. This assumes 50 percent of the buses to be articulated

with a PCE of 4 and the remainder to be single unit buses with a PCE factor of 2.2.

- 2030 general purpose traffic volumes were converted to PCEs assuming 5% heavy vehicles with a PCE factor of 2.2.

The 8 Lane - Base alternative (Figure 19) shows the general purpose lanes during peak periods to be operating at a V/C ratio of 1.0 with operating speeds ranging between 40 mph and 50. While, the HOV lanes operate at V/C ratios ranging between 0.40 and 0.75 and an average speed of 60 mph.

With the conversion of 2 general purpose lanes to 2 HOV lanes in the Managed Lanes alternative, the travel conditions during the peak periods on the general purpose lanes deteriorate to V/C ratios of 1.00 to 1.10, with speeds dropping down to the 20mph – 25mph range. The HOV lanes still continue to operate under uncongested conditions – V/C ratios of 0.40 to 0.80 and an average speed of 60 mph (Figure 20).

Summary

The demand for non-HOV trips on the Trans-Lake corridor is considerably higher than for HOV trips. The provision of additional HOV capacity on the corridor with limited access points to HOV 2 users does create a large shift of non-HOV trips to HOV trips. However, our analysis shows a significant amount of capacity to be still available in the Managed Lanes. Providing full access to HOV 2 users beyond just those allowed in the Managed Lanes alternative could lead to additional HOV 2 trips diverting from the general purpose lanes to the HOV lanes. This could result in improving operating conditions on the general purpose lanes, while providing for a more balanced flow of non-HOV and HOV trips along the corridor. Another possibility for using the excess capacity on the managed lanes, as well as balance HOV and non-HOV flows would be to allow SOV to pay a fee for using the uncongested managed lanes.

Figure 19
Year 2030 Mid-Lake SR-520 V/C Ratio and Speed
8-Lane Alternative - No Toll

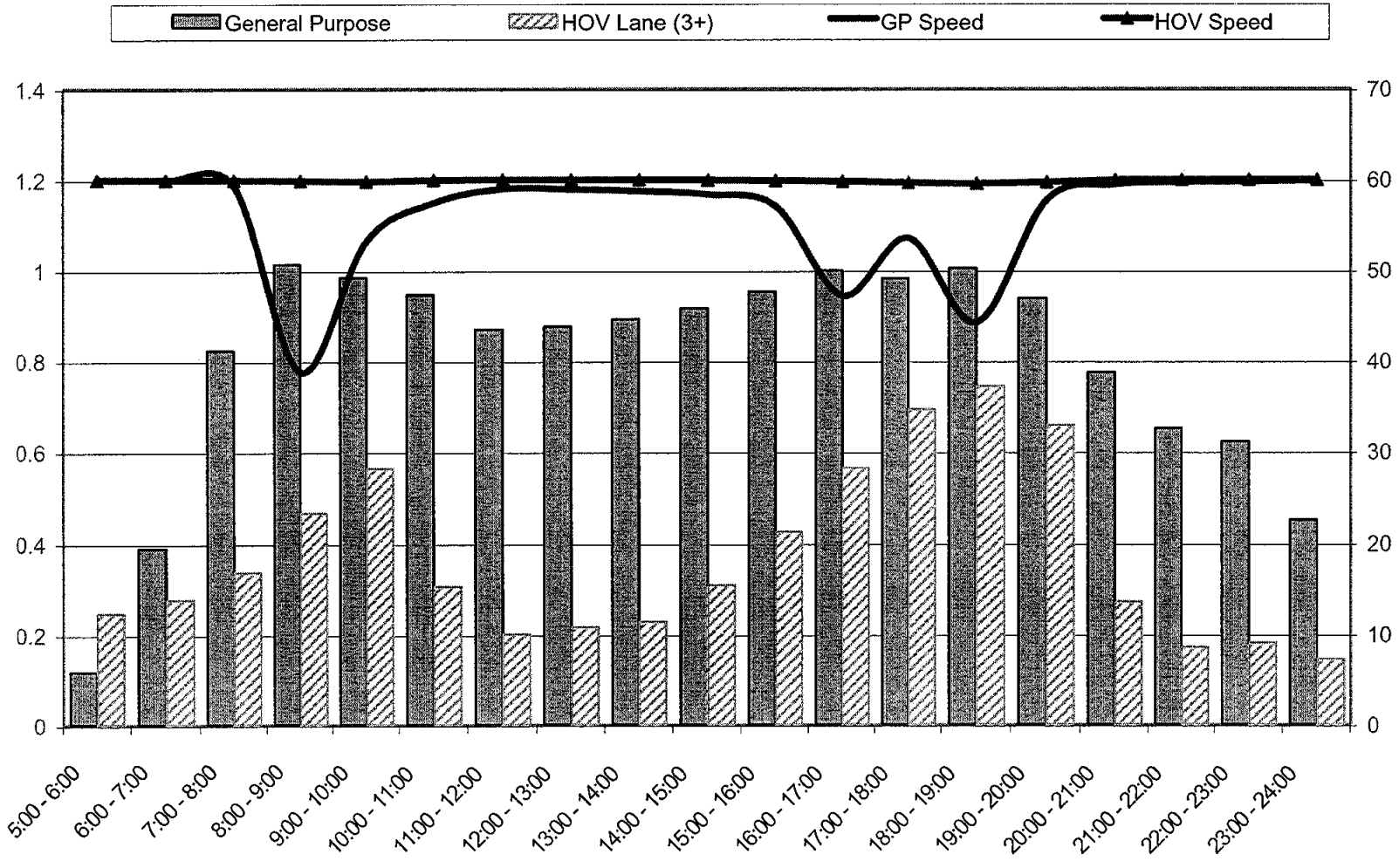
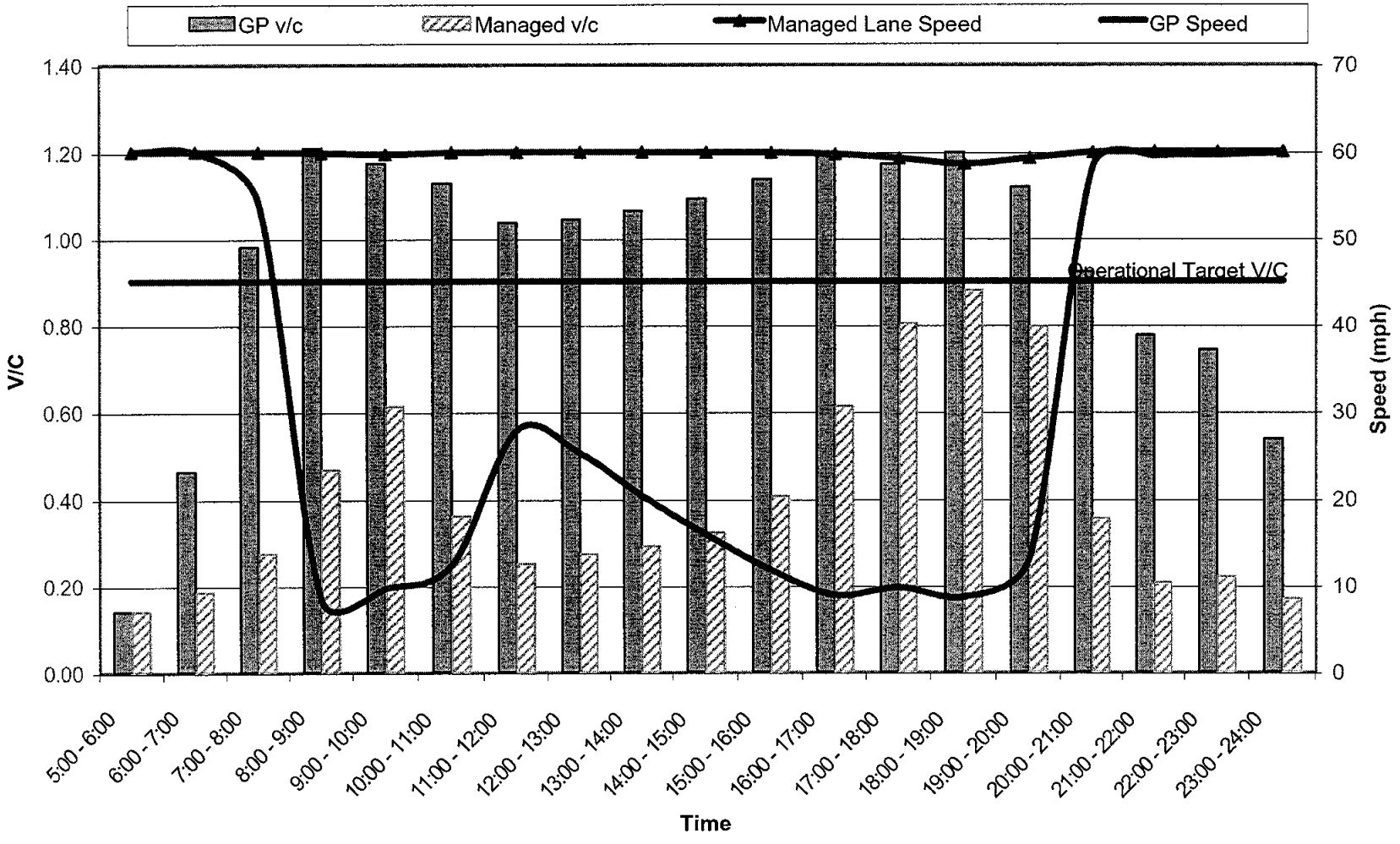


Figure 20
Year 2030 Mid-Lake SR-520 V/C Ratio and Speed
8-Lane Alternative - Managed Lanes



SUMMARY OF FINDINGS – TRANS-LAKE PRICING ANALYSIS

Pricing Assumptions - Base Value of Time:

- Average peak period toll for one-way trip on the full length of SR 520 in 2014: $1.15 to $1.80
- Average peak period toll for one-way trip on the full length of SR 520 in 2030: $1.41 to $2.43
- Average peak period toll for one-way trip on the full length of I-90 in 2014: $0.80 to $1.20
- Average peak period toll for one-way trip on the full length of I-90 in 2030: $0.93 to $1.73

Pricing Assumptions - Low Value of Time:

- Average peak period toll for one-way trip on the full length of SR 520 in 2014: $0.77 to $1.15
- Average peak period toll for one-way trip on the full length of SR 520 in 2030: $0.90 to $1.54
- Average peak period toll for one-way trip on the full length of I-90 in 2014: $0.53 to $0.80
- Average peak period toll for one-way trip on the full length of I-90 in 2030: $0.67 to $1.20

Findings from Value Pricing on SR 520:

The following summary observations can be made based upon the modeling and traffic analyses conducted in this study:

- Value pricing has an overall impact on the travel demand, travel patterns, and traffic operations in the Trans-Lake corridor.
- The travel demand analyses show decreases in person and vehicle throughput when pricing is introduced to the Trans-Lake corridor. The decreases in person throughput are in the range of 10 to 15 percent, while reductions in vehicle throughput are around 20 percent.
- The traffic analysis shows improvements to operating conditions on the Lake Washington bridge. On average, the V/C ratios on the general purpose lanes along the corridor improve by 25 percent, accompanied by increases in operating speeds to reflect uncongested flows on the general purpose lanes on SR 520, while HOV lanes continue to operate at uncongested speeds.
- The mode share analyses show HOV and transit trips to increase by 6 to 10 percent when pricing is introduced to the corridor.
- An analysis of the travel patterns shows diversion of traffic resulting from peak period value pricing. The reductions in vehicular traffic on SR 520, results in diversion of traffic to the I-90 and SR 522 corridors, and on to local eastside arterials:
  - 20 percent decrease in traffic on SR 520
  - 8 to 11 percent increases in traffic on I-90
  - 4 to 6 percent increase in traffic on SR 522
  - 3 to 5 percent increase in traffic on arterial roadways in the communities of Seattle, Bellevue, Kirkland, Redmond, and the Points Communities.

Findings from Value Pricing on SR 520 and I-90:

While, most of the trends are similar to that observed from value pricing on SR 520 only, the changes in travel patterns and traffic diversion impacts are of a lower order.

- Pricing does impact the travel demand, travel patterns, and traffic operations in the Trans-Lake corridors.
- The travel demand analyses show decreases in person and vehicle throughput when pricing is introduced to the Trans-Lake corridors. While the decreases in person throughput are in the range of 5 to 11 percent, reductions in vehicle throughput range from 12 to 15 percent.
- While, the traffic analysis shows improvements to operating conditions on SR 520 and I-90, SR 522 shows a degradation in operating conditions. On average, the V/C ratios on the general purpose lanes (on SR 520 and I-90) along the corridor improve by 20 percent, accompanied by increases in operating speeds on the general purpose lanes. HOV lanes continue to operate at uncongested speeds on both SR 520 and I-90. Operating conditions on SR 522 deteriorate the most when both SR 520 and I-90 are priced.
- The mode share analysis show HOV and transit trips to increase in the range on 3 to 8 percent when pricing is introduced on both SR 520 and I-90.
- An analysis of the travel patterns shows the following displacement of traffic resulting from pricing travel on SR 520 and I-90. In general, the reduction in daily trips on SR 520 and I-90, results in traffic being diverted to the SR 522 corridor, and on to local eastside arterials:
    - 14 to 16 percent decrease in traffic on SR 520
    - 6 to 12 percent decrease in traffic on I-90
    - 7 to 17 percent increase in traffic on SR 522
    - 5 to 10 percent increase in traffic on arterial roadways in the communities of Seattle, Bellevue, Kirkland, Redmond, and the Points Communities.

General Conclusions on Pricing and Managed Lanes

The following general conclusions on travel demand and traffic operations can be made with respect to the pricing and managed lanes concepts analyzed in this study.

- The 15 to 20 percent reduction in vehicular trips in response to pricing is consistent with the theory and observations from other value pricing studies. This results in overall improvements to the traffic flow and operations along the Trans-Lake corridor. As a point of reference, it is worth noting that this reduction in vehicle trips is comparable to the 16% increase in daily traffic observed when tolls were removed from SR 520 in 1979.

- Pricing non-HOV trips on the Trans-Lake corridors results in increased carpooling and transit trips across Lake Washington. The increases range between 3 and 10 percent.

- Pricing has an impact on travel patterns across Lake Washington. The largest displacement of trips occurs when both SR 520 and I-90 are priced – increases of 7 to 17 percent on SR 522, and 5 to 10 percent on Seattle and Eastside arterials. Traffic diversions resulting from pricing only the Trans-Lake corridor, show increases of 4 to 6 percent on SR 522, 3 to 5 percent increase on Seattle and Eastside arterials, and 8 to 11 percent on I-90.

- Congestion levels can be improved using pricing strategies during peak periods of travel.

- The revenue estimates for a stand-alone SR 520 toll (value priced) facility, in inflated year of collection dollars are:

  Year 2014: $17.7 M - $30.9 M

  Year 2030: $38.4 M - $66.7 M

- Managed lanes provide improved corridor speeds, in comparison to the general purpose lanes.

- Managed lanes operating on access restrictions and occupancy requirements alone are forecast to have excess or "un-used" capacity that could be allocated to other users. Based on the model results, there is enough capacity to allow low occupant vehicles (i.e., SOV and HOV 2 users) to use the managed lanes for a fee. This would result in increased person throughput when compared to the 8 Lane Base scenario.

- Managed lanes could provide better person throughput when compared to an HOV 3+ concept, while maintaining the same vehicle throughput.

RECOMMENDED NEXT STEPS

Since the initial results from the value pricing and managed lanes concepts tested show promise in reducing congestion and improving traffic operations in the Trans-Lake corridor, there is merit in continuing to build upon what has already been tested. The following additional steps are recommended towards this end:

- The regional PSRC travel demand models are currently in the process of being updated. It is expected that the key methodological components of this model, i.e., trip distribution, mode choice, and time-of-day analysis models will be replaced once the ongoing PSRC Model Improvement Program is successfully completed in late-Fall. It is recommended that value pricing and managed lanes concepts be tested with the Preferred Alternative using the updated regional models.

- The value pricing concepts tested in this study assumed tolls on SR 520 and I-90 only. The Washington Department of Transportation (WSDOT) has embarked on a region-wide analysis of pricing. It is recommended that the results from this study be compared with the regional analysis to better understand the travel demand interplay between pricing on one or two corridors, versus a region-wide pricing approach.

- Another option for furthering the value pricing concept would be to develop a cooperative regional pricing plan, wherein the Trans-Lake corridor could serve as a pilot demonstration project.

- Any further analysis of the value pricing concept should include a detailed traffic diversion analysis that identifies the relative impacts of traffic diversion on local arterials.

- The value pricing methodology currently being used does not include a discrete toll model. Hence the estimates of toll rates from this analysis should be viewed as a preliminary estimate of economically efficient toll rates based on managing travel demand. If value pricing is recommended for inclusion in the EIS, a more extensive effort will be required to collect appropriate survey data and develop a toll mode choice model. Such an effort is usually required for the development of investment-grade toll estimates.

- Any further analysis of the managed lanes concept should consider the potential for low occupant vehicles (i.e., SOV and HOV 2) to use the managed lanes for a fee.

- The managed lanes concept was only tested on SR 520. It is recommended that a system-wide analysis of the managed lanes concept be undertaken to fully understand how managed lanes on SR 520 would connect and operate with the managed lanes on I-405, I-90, and I-5.

APPENDIX

Table 1a
Daily Trans-Lake Vehicle and Person Trip Volumes and Modal Split

Translake 2030 No-Action

Roadway Facility	Daily Vehicle Volumes				Daily Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	62,000	1,200	9,200	72,400	82,500	3,800	9,200	8,100	103,600
Modal Share (%)					79.6%	3.7%	8.9%	7.8%	100.0%
SR 520 (L. Wash. Bridge)	103,900	8,000	31,500	143,400	138,200	25,200	31,500	35,800	230,700
Modal Share (%)					59.9%	10.9%	13.7%	15.5%	100.0%
I-90 (West Bridge)	130,400	8,600	36,000	175,000	173,500	27,100	36,000	42,200	278,800
Modal Share (%)					62.2%	9.7%	12.9%	15.1%	100.0%
Total Trans-Lake	296,300	17,800	76,700	390,800	394,200	56,100	76,700	86,100	613,100
Modal Share (%)					64.3%	9.2%	12.5%	14.0%	100.0%

Translake 2030 No-Action Toll on SR520

Roadway Facility	Daily Vehicle Volumes				Daily Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	65,400	1,300	9,700	76,400	87,000	4,100	9,700	8,300	109,100
Modal Share (%)					79.7%	3.8%	8.9%	7.6%	100.0%
SR 520 (L. Wash. Bridge)	79,400	7,300	26,000	112,700	105,700	22,900	26,000	41,500	196,100
Modal Share (%)					53.9%	11.7%	13.3%	21.2%	100.0%
I-90 (West Bridge)	140,900	9,800	39,800	190,500	187,400	30,900	39,800	42,600	300,700
Modal Share (%)					62.3%	10.3%	13.2%	14.2%	100.0%
Total Trans-Lake	285,700	18,400	75,500	379,600	380,100	53,000	75,500	92,400	605,900
Modal Share (%)					62.7%	8.7%	12.5%	15.3%	99.2%

Translake 2030 No-Action Toll on SR520 and I-90

Roadway Facility	Daily Vehicle Volumes				Daily Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	71,200	1,400	10,500	83,100	94,700	4,500	10,500	8,500	118,200
Modal Share (%)					80.1%	3.8%	8.9%	7.2%	100.0%
SR 520 (L. Wash. Bridge)	86,000	6,100	29,600	121,700	114,400	19,100	29,600	41,200	204,300
Modal Share (%)					56.0%	9.3%	14.5%	20.2%	100.0%
I-90 (West Bridge)	114,800	10,600	34,000	159,400	152,700	33,300	34,000	43,600	263,600
Modal Share (%)					57.9%	12.6%	12.9%	16.5%	100.0%
Total Trans-Lake	272,000	18,100	74,100	364,200	361,800	50,900	74,100	93,300	586,100
Modal Share (%)					61.7%	8.7%	12.6%	15.9%	99.0%

NOTES:

- The information presented in this table was directly produced by the model without any post-processing analysis.
- Non-HOVs represent auto vehicles with driver or one passenger. An average occupancy factor of 1.33 was used to convert vehicle volumes to person volumes for Non-HOV trips.
- HOVs represent auto vehicles with 3 or more occupants. An average occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips.

Table 1b
PM Peak Period Trans-Lake Vehicle and Person Trip Volumes and Modal Split

Translake 2030 No-Action

Roadway Facility	PM Peak Period Vehicle Volumes				PM Peak Period Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	17,100	300	1,400	18,800	22,800	1,000	1,400	2,800	28,000
Modal Share (%)					81.4%	3.6%	5.0%	10.0%	100.0%
SR 520 (L. Wash. Bridge)	27,400	2,000	4,500	33,900	36,500	6,300	4,500	14,200	61,500
Modal Share (%)					59.3%	10.2%	7.3%	23.1%	100.0%
I-90 (West Bridge)	36,100	2,400	5,200	43,700	48,100	7,600	5,200	15,200	76,100
Modal Share (%)					63.2%	10.0%	6.8%	20.0%	100.0%
Total Trans-Lake	80,600	4,700	11,100	96,400	107,400	14,900	11,100	32,200	165,600
Modal Share (%)					64.9%	9.0%	6.7%	19.4%	100.0%

Translake 2030 No-Action Toll on SR520

Roadway Facility	PM Peak Period Vehicle Volumes				PM Peak Period Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	18,200	400	1,500	20,100	24,300	1,300	1,500	2,800	29,900
Modal Share (%)					81.3%	4.3%	5.0%	9.4%	100.0%
SR 520 (L. Wash. Bridge)	20,800	1,600	3,700	26,100	27,700	5,200	3,700	16,700	53,300
Modal Share (%)					52.0%	9.8%	6.9%	31.3%	100.0%
I-90 (West Bridge)	38,400	2,600	5,700	46,700	51,100	8,200	5,700	15,200	80,200
Modal Share (%)					63.7%	10.2%	7.1%	19.0%	100.0%
Total Trans-Lake	77,400	4,600	10,900	92,900	103,100	14,700	10,900	34,700	163,400
Modal Share (%)					63.1%	9.0%	6.7%	21.2%	100.0%

Translake 2030 No-Action Toll on SR520 and I-90

Roadway Facility	PM Peak Period Vehicle Volumes				PM Peak Period Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	19,700	400	1,600	21,700	26,300	1,300	1,600	2,900	32,100
Modal Share (%)					81.9%	4.0%	5.0%	9.0%	100.0%
SR 520 (L. Wash. Bridge)	23,000	1,400	4,200	28,600	30,600	4,500	4,200	16,100	55,400
Modal Share (%)					55.2%	8.1%	7.6%	29.1%	100.0%
I-90 (West Bridge)	30,400	2,700	4,900	38,000	40,500	8,600	4,900	16,200	70,200
Modal Share (%)					57.7%	12.3%	7.0%	23.1%	100.0%
Total Trans-Lake	73,100	4,500	10,700	88,300	97,400	14,400	10,700	35,200	157,700
Modal Share (%)					61.8%	9.1%	6.8%	22.3%	100.0%

NOTES:

- The information presented in this table was directly produced by the model without any post-processing analysis.
- Non-HOVs represent auto vehicles with driver or one passenger. An average occupancy factor of 1.33 was used to convert vehicle volumes to person volumes for Non-HOV trips.
- HOVs represent auto vehicles with 3 or more occupants. An average occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips.

Table 2a
Daily Trans-Lake Vehicle and Person Trip Volumes and Modal Split

Translake 6-Lane Alternative

Roadway Facility	Daily Vehicle Volumes				Daily Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	61,300	1,000	9,100	71,400	81,600	3,200	9,100	6,800	100,700
Modal Share (%)					81.0%	3.2%	9.0%	6.8%	100.0%
SR 520 (L. Wash. Bridge)	113,900	12,300	32,900	159,100	151,500	38,800	32,900	50,900	274,100
Modal Share (%)					55.3%	14.2%	12.0%	18.6%	100.0%
I-90 (West Bridge)	125,400	5,600	35,300	166,300	166,800	17,700	35,300	37,300	257,100
Modal Share (%)					64.9%	6.9%	13.7%	14.5%	100.0%
Total Trans-Lake	300,600	18,900	77,300	396,800	399,900	59,700	77,300	95,000	631,900
Modal Share (%)					63.3%	9.4%	12.2%	15.0%	100.0%

Translake 6-Lane Alternative Toll on SR520

Roadway Facility	Daily Vehicle Volumes				Daily Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	64,800	1,000	9,700	75,500	86,200	3,200	9,700	6,800	105,900
Modal Share (%)					81.4%	3.0%	9.2%	6.4%	100.0%
SR 520 (L. Wash. Bridge)	85,900	14,300	27,600	127,800	114,300	45,100	27,600	58,800	245,800
Modal Share (%)					46.5%	18.3%	11.2%	23.9%	100.0%
I-90 (West Bridge)	139,100	5,400	39,700	184,200	185,100	17,100	39,700	37,300	279,200
Modal Share (%)					66.3%	6.1%	14.2%	13.4%	100.0%
Total Trans-Lake	289,800	20,700	77,000	387,500	385,600	65,400	77,000	102,900	630,900
Modal Share (%)					61.1%	10.4%	12.2%	16.3%	100.0%

Translake 6-Lane Alternative Toll on SR520 and I-90

Roadway Facility	Daily Vehicle Volumes				Daily Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	71,900	1,000	10,600	83,500	95,700	3,200	10,600	6,900	116,400
Modal Share (%)					82.2%	2.7%	9.1%	5.9%	100.0%
SR 520 (L. Wash. Bridge)	93,800	14,200	32,400	140,400	124,800	44,700	32,400	57,500	259,400
Modal Share (%)					48.1%	17.2%	12.5%	22.2%	100.0%
I-90 (West Bridge)	116,100	5,100	34,400	155,600	154,500	16,100	34,400	38,500	243,500
Modal Share (%)					63.4%	6.6%	14.1%	15.8%	100.0%
Total Trans-Lake	281,800	20,300	77,400	379,500	375,000	64,000	77,400	102,900	619,300
Modal Share (%)					60.6%	10.3%	12.5%	16.6%	100.0%

NOTES:

- The information presented in this table was directly produced by the model without any post-processing analysis.
- Non-HOVs represent auto vehicles with driver or one passenger. An average occupancy factor of 1.33 was used to convert vehicle volumes to person volumes for Non-HOV trips.
- HOVs represent auto vehicles with 3 or more occupants. An average occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips.

Table 2b
PM Peak Period Trans-Lake Vehicle and Person Trip Volumes and Modal Split

Translake 6-Lane Alternative

Roadway Facility	PM Peak Period Vehicle Volumes				PM Peak Period Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	16,900	300	1,400	18,600	22,500	1,000	1,400	2,500	27,400
Modal Share (%)					82.1%	3.6%	5.1%	9.1%	100.0%
SR 520 (L. Wash. Bridge)	30,000	3,400	4,700	38,100	39,900	10,800	4,700	18,800	74,200
Modal Share (%)					53.8%	14.6%	6.3%	25.3%	100.0%
I-90 (West Bridge)	34,800	1,400	5,100	41,300	46,300	4,500	5,100	13,900	69,800
Modal Share (%)					66.3%	6.4%	7.3%	19.9%	100.0%
Total Trans-Lake	81,700	5,100	11,200	98,000	108,700	16,300	11,200	35,200	171,400
Modal Share (%)					63.4%	9.5%	6.5%	20.5%	100.0%

Translake 6-Lane Alternative Toll on SR520

Roadway Facility	PM Peak Period Vehicle Volumes				PM Peak Period Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	18,000	300	1,500	19,800	24,000	1,000	1,500	2,500	29,000
Modal Share (%)					82.8%	3.4%	5.2%	8.6%	100.0%
SR 520 (L. Wash. Bridge)	22,500	3,900	4,000	30,400	30,000	12,400	4,000	21,400	67,800
Modal Share (%)					44.2%	18.3%	5.9%	31.6%	100.0%
I-90 (West Bridge)	38,000	1,300	5,700	45,000	50,600	4,100	5,700	13,900	74,300
Modal Share (%)					68.1%	5.5%	7.7%	18.7%	100.0%
Total Trans-Lake	78,500	5,500	11,200	95,200	104,600	17,500	11,200	37,800	171,100
Modal Share (%)					61.1%	10.2%	6.5%	22.1%	100.0%

Translake 6-Lane Alternative Toll on SR520 and I-90

Roadway Facility	PM Peak Period Vehicle Volumes				PM Peak Period Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	19,700	300	1,600	21,600	26,300	1,000	1,600	2,500	31,400
Modal Share (%)					83.8%	3.2%	5.1%	8.0%	100.0%
SR 520 (L. Wash. Bridge)	25,000	3,900	4,600	33,500	33,300	12,200	4,600	20,700	70,800
Modal Share (%)					47.0%	17.2%	6.5%	29.2%	100.0%
I-90 (West Bridge)	30,900	1,200	4,900	37,000	41,100	3,900	4,900	14,900	64,800
Modal Share (%)					63.4%	6.0%	7.6%	23.0%	100.0%
Total Trans-Lake	75,600	5,400	11,100	92,100	100,700	17,100	11,100	38,100	167,000
Modal Share (%)					60.3%	10.2%	6.6%	22.8%	100.0%

NOTES:

- The information presented in this table was directly produced by the model without any post-processing analysis.
- Non-HOVs represent auto vehicles with driver or one passenger. An average occupancy factor of 1.33 was used to convert vehicle volumes to person volumes for Non-HOV trips.
- HOVs represent auto vehicles with 3 or more occupants. An average occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips.

Table 3a
Daily Trans-Lake Vehicle and Person Trip Volumes and Modal Split

Translake 8-Lane Alternative

	Daily Vehicle Volumes				Daily Person Trip Volumes				
Roadway Facility	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	59,300	1,000	8,800	69,100	78,900	3,200	8,800	6,900	97,800
Modal Share (%)					80.7%	3.3%	9.0%	7.1%	100.0%
SR 520 (L. Wash. Bridge)	146,200	12,700	39,800	198,700	194,500	40,100	39,800	53,300	327,700
Modal Share (%)					59.4%	12.2%	12.1%	16.3%	100.0%
I-90 (West Bridge)	116,100	5,700	33,700	155,500	154,500	18,000	33,700	37,900	244,100
Modal Share (%)					63.3%	7.4%	13.8%	15.5%	100.0%
Total Trans-Lake	321,600	19,400	82,300	423,300	427,900	61,300	82,300	98,100	669,600
Modal Share (%)					63.9%	9.2%	12.3%	14.7%	100.0%

Translake 8-Lane Alternative Toll on SR520

	Daily Vehicle Volumes				Daily Person Trip Volumes				
Roadway Facility	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	61,400	1,000	9,100	71,500	81,700	3,200	9,100	6,900	100,900
Modal Share (%)					81.0%	3.2%	9.0%	6.8%	100.0%
SR 520 (L. Wash. Bridge)	110,500	14,800	32,800	158,100	147,000	46,500	32,800	59,600	285,900
Modal Share (%)					51.4%	16.3%	11.5%	20.8%	100.0%
I-90 (West Bridge)	126,000	5,500	35,200	166,700	167,600	17,400	35,200	37,900	258,100
Modal Share (%)					65.1%	6.8%	13.7%	14.5%	100.0%
Total Trans-Lake	297,900	21,300	77,100	396,300	396,300	67,100	77,100	104,400	644,900
Modal Share (%)					61.5%	10.4%	12.0%	16.2%	100.0%

Translake 8-Lane Alternative Toll on SR520 and I-90

	Daily Vehicle Volumes				Daily Person Trip Volumes				
Roadway Facility	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	63,500	1,000	9,400	73,900	84,500	3,200	9,400	6,900	104,000
Modal Share (%)					81.3%	3.1%	9.0%	6.6%	100.0%
SR 520 (L. Wash. Bridge)	120,500	14,400	36,200	171,100	160,300	45,300	36,200	58,100	299,900
Modal Share (%)					53.5%	15.1%	12.1%	19.4%	100.0%
I-90 (West Bridge)	101,300	5,400	29,700	136,400	134,800	17,000	29,700	39,400	220,900
Modal Share (%)					61.0%	7.7%	13.4%	17.8%	100.0%
Total Trans-Lake	285,300	20,800	75,300	381,400	379,600	65,500	75,300	104,400	624,800
Modal Share (%)					60.8%	10.5%	12.1%	16.7%	100.0%

NOTES:

- The information presented in this table was directly produced by the model without any post-processing analysis.
- Non-HOVs represent auto vehicles with driver or one passenger. An average occupancy factor of 1.33 was used to convert vehicle volumes to person volumes for Non-HOV trips.
- HOVs represent auto vehicles with 3 or more occupants. An average occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips.

Table 3b
PM Peak Period Trans-Lake Vehicle and Person Trip Volumes and Modal Split

Translake 8-Lane Alternative

Roadway Facility	PM Peak Period Vehicle Volumes				PM Peak Period Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	16,400	300	1,300	18,000	21,900	1,000	1,300	2,500	26,700
Modal Share (%)					82.0%	3.7%	4.9%	9.4%	100.0%
SR 520 (L. Wash. Bridge)	39,300	3,400	5,700	48,400	52,300	10,800	5,700	19,600	88,400
Modal Share (%)					59.2%	12.2%	6.4%	22.2%	100.0%
I-90 (West Bridge)	32,200	1,500	4,900	38,600	42,900	4,800	4,900	14,100	66,700
Modal Share (%)					64.3%	7.2%	7.3%	21.1%	100.0%
Total Trans-Lake	87,900	5,200	11,900	105,000	117,100	16,600	11,900	36,200	181,800
Modal Share (%)					64.4%	9.1%	6.5%	19.9%	100.0%

Translake 8-Lane Alternative Toll on SR520

Roadway Facility	PM Peak Period Vehicle Volumes				PM Peak Period Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	17,000	300	1,400	18,700	22,700	1,000	1,400	2,500	27,600
Modal Share (%)					82.2%	3.6%	5.1%	9.1%	100.0%
SR 520 (L. Wash. Bridge)	29,400	4,000	4,700	38,100	39,200	12,700	4,700	21,900	78,500
Modal Share (%)					49.9%	16.2%	6.0%	27.9%	100.0%
I-90 (West Bridge)	34,900	1,400	5,100	41,400	46,500	4,500	5,100	14,100	70,200
Modal Share (%)					66.2%	6.4%	7.3%	20.1%	100.0%
Total Trans-Lake	81,300	5,700	11,200	98,200	108,400	18,200	11,200	38,500	176,300
Modal Share (%)					61.5%	10.3%	6.4%	21.8%	100.0%

Translake 8-Lane Alternative Toll on SR520 and I-90

Roadway Facility	PM Peak Period Vehicle Volumes				PM Peak Period Person Trip Volumes				
	Non-HOV	HOV(3+)	Commercial	Total	Non-HOV	HOV(3+)	Commercial	Bus Transit	Total
SR 522 (West of 61st Ave.NE)	17,700	300	1,400	19,400	23,600	1,000	1,400	2,500	28,500
Modal Share (%)					82.8%	3.5%	4.9%	8.8%	100.0%
SR 520 (L. Wash. Bridge)	32,100	3,900	5,200	41,200	42,700	12,400	5,200	21,200	81,500
Modal Share (%)					52.4%	15.2%	6.4%	26.0%	100.0%
I-90 (West Bridge)	27,600	1,400	4,200	33,200	36,800	4,400	4,200	15,000	60,400
Modal Share (%)					60.9%	7.3%	7.0%	24.8%	100.0%
Total Trans-Lake	77,400	5,600	10,800	93,800	103,100	17,800	10,800	38,700	170,400
Modal Share (%)					60.5%	10.4%	6.3%	22.7%	100.0%

NOTES:

- The information presented in this table was directly produced by the model without any post-processing analysis.
- Non-HOVs represent auto vehicles with driver or one passenger. An average occupancy factor of 1.33 was used to convert vehicle volumes to person volumes for Non-HOV trips.
- HOVs represent auto vehicles with 3 or more occupants. An average occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips.

Table 1a
AM Peak Period Vehicle Volumes at Selected Screenline Locations
Theme: 8 Lane Alternative with Managed Lanes
Translake Study

Screenline	SR 520 Mainline SOV 1 Person	HOV (2) 2 Persons	HOV (3+) 3 or more	Commercial	Total	SR 520 Managed Lanes SOV 1 Person	HOV (2) 2 Persons	HOV (3+) 3 or more	Commercial	Total	Screenline Total
Lake Washington Bridge	24,400	100	100	2,800	27,400	-	7,400	4,100	-	11,500	38,900
Share by Facility (%)					70%					30%	100%
East of Bellevue Way NE and West of I-405	19,800	900	400	1,900	23,000	-	5,400	3,100	-	8,500	31,500
Share by Facility (%)					73%					27%	100%
East of I-405 and West of 124th NE	15,900	1,800	1,500	1,500	20,700	-	3,100	1,600	-	4,700	25,400
Share by Facility (%)					81%					19%	100%
North of NE 51st and West of W Lake Sammamish	26,400	1,000	300	2,000	29,700	-	2,800	1,300	-	4,100	33,800
Share by Facility (%)					88%					12%	100%
Total	86,500	3,800	2,300	8,200	100,800	-	18,700	10,100	-	28,800	129,600

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- SOV represent single occupancy vehicles.
- HOV (2) represent vehicles with driver plus one passenger.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 1b
AM Peak Period Person Trips at Selected Screenline Locations
Theme: 8 Lane Alternative with Managed Lanes
Translake Study

Screenline	SR 520 Mainline					SR 520 Managed Lanes					Screenline Total
	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	HOV (2) 2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	
Lake Washington Bridge	24,600	400	2,800	-	27,800	14,800	13,000	-	19,300	47,100	74,900
Share by Facility (%)	88.5%	1.4%	10.1%	0.0%	100%	31.4%	27.6%	0.0%	41.0%	100%	
East of Bellevue Way NE and West of I-405	21,600	1,300	1,900	-	24,800	10,800	9,800	-	20,700	41,300	66,100
Share by Facility (%)	87.1%	5.2%	7.7%	0.0%	100%	26.2%	23.7%	0.0%	50.1%	100%	
East of I-405 and West of 124th NE	19,500	4,800	1,500	-	25,800	6,200	5,100	-	5,900	17,200	43,000
Share by Facility (%)	75.6%	18.6%	5.8%	0.0%	100%	36.0%	29.7%	0.0%	34.3%	100%	
North of NE 51st and West of W Lake Sammamish	28,400	1,000	2,000	-	31,400	5,600	4,100	-	3,300	13,000	44,400
Share by Facility (%)	90.4%	3.2%	6.4%	0.0%	100%	43.1%	31.5%	0.0%	25.4%	100%	
Screenline Total by Mode	94,100	7,500	8,200	-	109,800	37,400	32,000	-	49,200	69,400	179,200
Screenline Modal Share (%)	85.7%	6.8%	7.5%	0.0%	100.0%	53.9%	46.1%	0.0%	70.9%	100%	

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- SOV represent single occupancy vehicles.
- HOV (2) represent vehicles with driver plus one passenger.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 2a
PM Peak Period Vehicle Volumes at Selected Screenline Locations
Theme: 8 Lane Alternative with Managed Lanes
Translake Study

Screenline	SR 520 Mainline					SR 520 Managed Lanes					Screenline Total
	SOV 1 Person	HOV (2) 2 Persons	HOV (3+) 3 or more	Commercial	Total	SOV 1 Person	HOV (2) 2 Persons	HOV (3+) 3 or more	Commercial	Total	
Lake Washington Bridge	29,100	100	100	5,300	34,600	-	6,900	3,400	-	10,300	44,900
Share by Facility (%)					77%					23%	100%
East of Bellevue Way NE and West of I-405	24,700	300	100	3,700	28,800	-	5,500	2,800	-	8,300	37,100
Share by Facility (%)					78%					22%	100%
East of I-405 and West of 124th NE	20,700	1,600	1,300	3,200	26,800	-	2,700	1,100	-	3,800	30,600
Share by Facility (%)					88%					12%	100%
North of NE 51st and West of W Lake Sammamish	33,700	700	300	3,800	38,500	-	2,800	1,000	-	3,800	42,300
Share by Facility (%)					91%					9%	100%
Total	108,200	2,700	1,800	16,000	128,700	-	17,900	8,300	-	26,200	154,900

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- SOV represent single occupancy vehicles.
- HOV (2) represent vehicles with driver plus one passenger.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 2b
PM Peak Period Person Trips at Selected Screenline Locations
Theme: 8 Lane Alternative with Managed Lanes
Translake Study

Screenline	SR 520 Mainline					SR 520 Managed Lanes					Screenline Total
	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	HOV (2) 2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	
Lake Washington Bridge	29,300	400	5,300	-	35,000	13,800	10,800	-	19,300	43,900	78,900
Share by Facility (%)	83.7%	1.1%	15.1%	0.0%	100%	31.4%	24.6%	0.0%	44.0%	100%	
East of Bellevue Way NE and West of I-405	25,300	400	3,700	-	29,400	11,000	8,900	-	20,700	40,600	70,000
Share by Facility (%)	86.1%	1.4%	12.6%	0.0%	100%	27.1%	21.9%	0.0%	51.0%	100%	
East of I-405 and West of 124th NE	23,900	4,100	3,200	-	31,200	5,400	3,500	-	5,900	14,800	46,000
Share by Facility (%)	76.6%	13.1%	10.3%	0.0%	100%	36.5%	23.6%	0.0%	39.9%	100%	
North of NE 51st and West of W Lake Sammamish	35,100	1,000	3,800	-	39,900	5,600	3,200	-	3,300	12,100	52,000
Share by Facility (%)	88.0%	2.5%	9.5%	0.0%	100%	46.3%	26.4%	0.0%	27.3%	100%	
Screenline Total by Mode	113,600	5,900	16,000	-	135,500	35,800	26,400	-	49,200	62,200	197,700
Screenline Modal Share (%)	83.8%	4.4%	11.8%	0.0%	100.0%	57.6%	42.4%	0.0%	79.1%	100%	

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- SOV represent single occupancy vehicles.
- HOV (2) represent vehicles with driver plus one passenger.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 3a
Off Peak Period Vehicle Volumes at Selected Screenline Locations
Theme: 8 Lane Alternative with Managed Lanes
Translake Study

Screenline	SR 520 Mainline					SR 520 Managed Lanes					Screenline Total
	SOV 1 Person	HOV (2) 2 Persons	HOV (3+) 3 or more	Commercial	Total	SOV 1 Person	HOV (2) 2 Persons	HOV (3+) 3 or more	Commercial	Total	
Lake Washington Bridge	56,300	100	100	29,200	85,700	-	10,300	5,100	-	15,400	101,100
Share by Facility (%)					85%					15%	100%
East of Bellevue Way NE and West of I-405	49,200	400	200	20,400	70,200	-	8,100	4,100	-	12,200	82,400
Share by Facility (%)					85%					15%	100%
East of I-405 and West of 124th NE	41,000	2,500	2,000	17,300	62,800	-	3,900	2,000	-	5,900	68,700
Share by Facility (%)					91%					9%	100%
North of NE 51st and West of W Lake Sammamish	76,100	1,200	400	21,300	99,000	-	3,600	1,700	-	5,300	104,300
Share by Facility (%)					95%					5%	100%
Total	222,600	4,200	2,700	88,200	317,700	-	25,900	12,900	-	38,800	356,500

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- SOV represent single occupancy vehicles.
- HOV (2) represent vehicles with driver plus one passenger.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 3b
Off Peak Period Person Trips at Selected Screenline Locations
Theme: 8 Lane Alternative with Managed Lanes
Translake Study

Screenline	SR 520 Mainline					SR 520 Managed Lanes					Screenline Total
	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	HOV (2) 2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	
Lake Washington Bridge	56,500	400	29,200	-	86,100	20,600	16,100	-	13,800	50,500	136,600
Share by Facility (%)	65.6%	0.5%	33.9%	0.0%	100%	40.8%	31.9%	0.0%	27.3%	100%	
East of Bellevue Way NE and West of I-405	50,000	700	20,400	-	71,100	16,200	13,000	-	11,100	40,300	111,400
Share by Facility (%)	70.3%	1.0%	28.7%	0.0%	100%	40.2%	32.3%	0.0%	27.5%	100%	
East of I-405 and West of 124th NE	46,000	6,300	17,300	-	69,600	7,800	6,300	-	3,700	17,800	87,400
Share by Facility (%)	66.1%	9.1%	24.9%	0.0%	100%	43.8%	35.4%	0.0%	20.8%	100%	
North of NE 51st and West of W Lake Sammamish	78,500	1,300	21,300	-	101,100	7,200	5,400	-	3,100	15,700	116,800
Share by Facility (%)	77.6%	1.3%	21.1%	0.0%	100%	45.9%	34.4%	0.0%	19.7%	100%	
Screenline Total by Mode	231,000	8,700	88,200	-	327,900	51,800	40,800	-	31,700	92,600	420,500
Screenline Modal Share (%)	70.4%	2.7%	26.9%	0.0%	100.0%	55.9%	44.1%	0.0%	34.2%	100%	

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- SOV represent single occupancy vehicles.
- HOV (2) represent vehicles with driver plus one passenger.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 4a
Daily Vehicle Volumes at Selected Screenline Locations
Theme: 8 Lane Alternative with Managed Lanes
Translake Study

Screenline	SR 520 Mainline					SR 520 Managed Lanes					Screenline Total
	SOV 1 Person	HOV (2) 2 Persons	HOV (3+) 3 or more	Commercial	Total	SOV 1 Person	HOV (2) 2 Persons	HOV (3+) 3 or more	Commercial	Total	
Lake Washington Bridge	109,800	300	300	37,300	147,700	-	24,600	12,600	-	37,200	184,900
Share by Facility (%)					80%					20%	100%
East of Bellevue Way NE and West of I-405	93,700	1,600	700	26,000	122,000	-	19,000	10,000	-	29,000	151,000
Share by Facility (%)					81%					19%	100%
East of I-405 and West of 124th NE	77,600	5,900	4,800	22,000	110,300	-	9,700	4,700	-	14,400	124,700
Share by Facility (%)					88%					12%	100%
North of NE 51st and West of W Lake Sammamish	136,200	2,900	1,000	27,100	167,200	-	9,200	4,000	-	13,200	180,400
Share by Facility (%)					93%					7%	100%
Total	417,300	10,700	6,800	112,400	547,200	-	62,500	31,300	-	93,800	641,000

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- SOV represent single occupancy vehicles.
- HOV (2) represent vehicles with driver plus one passenger.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 4b
Daily Person Trips at Selected Screenline Locations
Theme: 8 Lane Alternative with Managed Lanes
Translake Study

Screenline	SR 520 Mainline					SR 520 Managed Lanes					Screenline Total
	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	HOV (2) 2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	
Lake Washington Bridge	110,400	1,200	37,300	-	148,900	49,200	39,900	-	52,400	141,500	290,400
Share by Facility (%)	74.1%	0.8%	25.1%	0.0%	100%	34.8%	28.2%	0.0%	37.0%	100%	
East of Bellevue Way NE and West of I-405	96,900	2,400	26,000	-	125,300	38,000	31,700	-	52,500	122,200	247,500
Share by Facility (%)	77.3%	1.9%	20.8%	0.0%	100%	31.1%	25.9%	0.0%	43.0%	100%	
East of I-405 and West of 124th NE	89,400	15,200	22,000	-	126,600	19,400	14,900	-	15,500	49,800	176,400
Share by Facility (%)	70.6%	12.0%	17.4%	0.0%	100%	39.0%	29.9%	0.0%	31.1%	100%	
North of NE 51st and West of W Lake Sammamish	142,000	3,300	27,100	-	172,400	18,400	12,700	-	9,700	40,800	213,200
Share by Facility (%)	82.4%	1.9%	15.7%	0.0%	100%	45.1%	31.1%	0.0%	23.8%	100%	
Screenline Total by Mode	438,700	22,100	112,400	-	573,200	125,000	99,200	-	130,100	224,200	797,400
Screenline Modal Share (%)	76.5%	3.9%	19.6%	0.0%	100.0%	55.8%	44.2%	0.0%	58.0%	100%	

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- SOV represent single occupancy vehicles.
- HOV (2) represent vehicles with driver plus one passenger.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 1a
AM Peak Period Vehicle Volumes at Selected Screenline Locations
Theme: 8 Lane Alternative
Translake Study

Screenline	SR 520 Mainline				SR 520 HOV Lanes				Screenline Total
	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Total	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Total	
Lake Washington Bridge	32,200	100	2,900	35,200	-	4,200	-	4,200	39,400
Share by Facility (%)				89%				11%	100%
East of Bellevue Way NE and West of I-405	25,200	600	2,100	27,900	-	3,000	-	3,000	30,900
Share by Facility (%)				90%				10%	100%
East of I-405 and West of 124th NE	20,500	100	1,600	22,200	-	3,200	-	3,200	25,400
Share by Facility (%)				87%				13%	100%
North of NE 51st and West of W Lake Sammamish	30,700	100	2,100	32,900	-	1,600	-	1,600	34,500
Share by Facility (%)				95%				5%	100%
Total	108,600	900	8,700	118,200	-	12,000	-	12,000	130,200

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- Non-HOVs represent auto vehicles with driver or driver plus one passenger. An average vehicle occupancy factor of 1.33 was used to convert vehicle volumes to person volumes for Non-HOV trips.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 1b
AM Peak Period Person Trips at Selected Screenline Locations
Theme: 8 Lane Alternative
Translake Study

Screenline	SR 520 Mainline					SR 520 HOV Lanes					Screenline Total
	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	
Lake Washington Bridge	42,900	400	2,900	-	46,200	-	13,300	-	19,600	32,900	79,100
Share by Facility (%)	92.9%	0.9%	6.3%	0.0%	100%	0.0%	40.4%	0.0%	59.6%	100%	
East of Bellevue Way NE and West of I-405	33,600	1,900	2,100	-	37,600	-	9,500	-	19,800	29,300	66,900
Share by Facility (%)	89.4%	5.1%	5.6%	0.0%	100%	0.0%	32.4%	0.0%	67.6%	100%	
East of I-405 and West of 124th NE	27,300	400	1,600	-	29,300	-	10,100	-	6,000	16,100	45,400
Share by Facility (%)	93.2%	1.4%	5.5%	0.0%	100%	0.0%	62.7%	0.0%	37.3%	100%	
North of NE 51st and West of W Lake Sammamish	40,900	400	2,100	-	43,400	-	5,100	-	4,400	9,500	52,900
Share by Facility (%)	94.2%	0.9%	4.8%	0.0%	100%	0.0%	53.7%	0.0%	46.3%	100%	
Screenline Total by Mode	144,700	3,100	8,700	-	156,500	-	38,000	-	49,800	38,000	194,500
Screenline Modal Share (%)	92.5%	2.0%	5.6%	0.0%	100.0%	0.0%	100.0%	0.0%	131.1%	100%	

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- Non-HOVs represent auto vehicles with driver or driver plus one passenger. An average vehicle occupancy factor of 1.33 was used to convert vehicle volumes to person volumes for Non-HOV trips.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 2a
PM Peak Period Vehicle Volumes at Selected Screenline Locations
Theme: 8 Lane Alternative
Translake Study

Screenline	SR 520 Mainline				SR 520 HOV Lanes				Screenline Total
	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Total	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Total	
Lake Washington Bridge	39,300	100	5,700	45,100	-	3,400	-	3,400	48,500
Share by Facility (%)				93%				7%	100%
East of Bellevue Way NE and West of I-405	33,000	100	4,100	37,200	-	2,800	-	2,800	40,000
Share by Facility (%)				93%				7%	100%
East of I-405 and West of 124th NE	27,400	100	3,500	31,000	-	2,600	-	2,600	33,600
Share by Facility (%)				92%				8%	100%
North of NE 51st and West of W Lake Sammamish	39,500	100	4,000	43,600	-	1,200	-	1,200	44,800
Share by Facility (%)				97%				3%	100%
Total	139,200	400	17,300	156,900	-	10,000	-	10,000	166,900

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- Non-HOVs represent auto vehicles with driver or driver plus one passenger. An average vehicle occupancy factor of 1.33 was used to convert vehicle volumes to person volumes for Non-HOV trips.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 2b
PM Peak Period Person Trips at Selected Screenline Locations
Theme: 8 Lane Alternative
Translake Study

Screenline	SR 520 Mainline					SR 520 HOV Lanes					Screenline Total
	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	
Lake Washington Bridge	52,300	400	5,700	-	58,400	-	10,800	-	19,600	30,400	88,800
Share by Facility (%)	89.6%	0.7%	9.8%	0.0%	100%	0.0%	35.5%	0.0%	64.5%	100%	
East of Bellevue Way NE and West of I-405	43,900	400	4,100	-	48,400	-	8,900	-	19,800	28,700	77,100
Share by Facility (%)	90.7%	0.8%	8.5%	0.0%	100%	0.0%	31.0%	0.0%	69.0%	100%	
East of I-405 and West of 124th NE	36,500	400	3,500	-	40,400	-	8,200	-	6,000	14,200	54,600
Share by Facility (%)	90.3%	1.0%	8.7%	0.0%	100%	0.0%	57.7%	0.0%	42.3%	100%	
North of NE 51st and West of W Lake Sammamish	52,600	400	4,000	-	57,000	-	3,800	-	4,400	8,200	65,200
Share by Facility (%)	92.3%	0.7%	7.0%	0.0%	100%	0.0%	46.3%	0.0%	53.7%	100%	
Screenline Total by Mode	185,300	1,600	17,300	-	204,200	-	31,700	-	49,800	31,700	235,900
Screenline Modal Share (%)	90.7%	0.8%	8.5%	0.0%	100.0%	0.0%	100.0%	0.0%	157.1%	100%	

NOTES:
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- Non-HOVs represent auto vehicles with driver or driver plus one passenger. An average vehicle occupancy factor of 1.33 was used to convert vehicle volumes to person volumes for Non-HOV trips.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 3a
Off Peak Peak Period Vehicle Volumes at Selected Screenline Locations
Theme: 8 Lane Alternative
Translake Study

Screenline	SR 520 Mainline				SR 520 HOV Lanes				Screenline Total
	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Total	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Total	
Lake Washington Bridge	74,900	100	31,300	106,300	-	5,100	-	5,100	111,400
Share by Facility (%)				95%				5%	100%
East of Bellevue Way NE and West of I-405	64,400	100	22,400	86,900	-	4,200	-	4,200	91,100
Share by Facility (%)				95%				5%	100%
East of I-405 and West of 124th NE	53,300	100	18,900	72,300	-	4,200	-	4,200	76,500
Share by Facility (%)				95%				5%	100%
North of NE 51st and West of W Lake Sammamish	85,000	100	22,400	107,500	-	2,000	-	2,000	109,500
Share by Facility (%)				98%				2%	100%
Total	277,600	400	95,000	373,000	-	15,500	-	15,500	388,500

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- Non-HOVs represent auto vehicles with driver or driver plus one passenger. An average vehicle occupancy factor of 1.33 was used to convert vehicle volumes to person volumes for Non-HOV trips.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 3b
Off Peak Period Person Trips at Selected Screenline Locations
Theme: 8 Lane Alternative
Translake Study

Screenline	SR 520 Mainline					SR 520 HOV Lanes					Screenline Total
	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	
Lake Washington Bridge	99,700	400	31,300	-	131,400	-	16,100	-	14,100	30,200	161,600
Share by Facility (%)	75.9%	0.3%	23.8%	0.0%	100%	0.0%	53.3%	0.0%	46.7%	100%	
East of Bellevue Way NE and West of I-405	85,700	400	22,400	-	108,500	-	13,300	-	10,800	24,100	132,600
Share by Facility (%)	79.0%	0.4%	20.6%	0.0%	100%	0.0%	55.2%	0.0%	44.8%	100%	
East of I-405 and West of 124th NE	70,900	400	18,900	-	90,200	-	13,300	-	3,900	17,200	107,400
Share by Facility (%)	78.6%	0.4%	21.0%	0.0%	100%	0.0%	77.3%	0.0%	22.7%	100%	
North of NE 51st and West of W Lake Sammamish	113,100	400	22,400	-	135,900	-	6,300	-	3,200	9,500	145,400
Share by Facility (%)	83.2%	0.3%	16.5%	0.0%	100%	0.0%	66.3%	0.0%	33.7%	100%	
Screenline Total by Mode	369,400	1,600	95,000	-	466,000	-	49,000	-	32,000	49,000	515,000
Screenline Modal Share (%)	79.3%	0.3%	20.4%	0.0%	100.0%	0.0%	100.0%	0.0%	65.3%	100%	

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- Non-HOVs represent auto vehicles with driver or driver plus one passenger. An average vehicle occupancy factor of 1.33 was used to convert vehicle volumes to person volumes for Non-HOV trips.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 4a
Daily Vehicle Volumes at Selected Screenline Locations
Theme: 8 Lane Alternative
Translake Study

Screenline	SR 520 Mainline Non-HOV 1&2 Persons	SR 520 Mainline HOV (3+) 3 or more	SR 520 Mainline Commercial	SR 520 Mainline Total	SR 520 HOV Lanes Non-HOV 1&2 Persons	SR 520 HOV Lanes HOV (3+) 3 or more	SR 520 HOV Lanes Commercial	SR 520 HOV Lanes Total	Screenline Total
Lake Washington Bridge	146,400	300	39,900	186,600	-	12,700	-	12,700	199,300
Share by Facility (%)				94%				6%	100%
East of Bellevue Way NE and West of I-405	122,600	800	28,600	152,000	-	10,000	-	10,000	162,000
Share by Facility (%)				94%				6%	100%
East of I-405 and West of 124th NE	101,200	300	24,000	125,500	-	10,000	-	10,000	135,500
Share by Facility (%)				93%				7%	100%
North of NE 51st and West of W Lake Sammamish	155,200	300	28,500	184,000	-	4,800	-	4,800	188,800
Share by Facility (%)				97%				3%	100%
Total	525,400	1,700	121,000	648,100	-	37,500	-	37,500	685,600

NOTES:
- The information presented in this table was directly produced by the model without any post-processing analysis.
- Non-HOVs represent auto vehicles with driver or driver plus one passenger. An average vehicle occupancy factor of 1.33 was used to convert vehicle volumes to person volumes for Non-HOV trips.
- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.

Table 4b
Daily Person Trips at Selected Screenline Locations
Theme: 8 Lane Alternative
Translake Study

Screenline	SR 520 Mainline					SR 520 HOV Lanes					Screenline Total
	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	Non-HOV 1&2 Persons	HOV (3+) 3 or more	Commercial	Bus Transit	Total	
Lake Washington Bridge	194,900	1,200	39,900	-	236,000	-	40,200	-	53,300	93,500	329,500
Share by Facility (%)	82.6%	0.5%	16.9%	0.0%	100%	0.0%	43.0%	0.0%	57.0%	100%	
East of Bellevue Way NE and West of I-405	163,200	2,700	28,600	-	194,500	-	31,700	-	50,400	82,100	276,600
Share by Facility (%)	83.9%	1.4%	14.7%	0.0%	100%	0.0%	38.6%	0.0%	61.4%	100%	
East of I-405 and West of 124th NE	134,700	1,200	24,000	-	159,900	-	31,600	-	15,900	47,500	207,400
Share by Facility (%)	84.2%	0.8%	15.0%	0.0%	100%	0.0%	66.5%	0.0%	33.5%	100%	
North of NE 51st and West of W Lake Sammamish	206,600	1,200	28,500	-	236,300	-	15,200	-	12,000	27,200	263,500
Share by Facility (%)	87.4%	0.5%	12.1%	0.0%	100%	0.0%	55.9%	0.0%	44.1%	100%	
Screenline Total by Mode	699,400	6,300	121,000	-	826,700	-	118,700	-	131,600	118,700	945,400
Screenline Modal Share (%)	84.6%	0.8%	14.6%	0.0%	100.0%	0.0%	100.0%	0.0%	110.9%	100%	

NOTES:
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- HOV3+ represent auto vehicles with 3 or more occupants. An average vehicles occupancy factor of 3.15 was used to convert vehicle volumes to person volumes for HOV trips. HOV values represent HOVs on GP and HOV lanes if one exists.